# Major Stormwater Management Plan (Major SWMP) For Pacifica Estates

PDS2006-3100-5510

# Preparation/Revision Date:

June 2014 February 2015 March 2015

### Prepared for:

Jose Luis Islas 2348 La Costa Ave. #311 Carlsbad, CA 92009

## Prepared by:

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The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan have been prepared under the direction of the following Registered Civil Engineer and meet the requirements of Regional Water Quality Control Board Order R9-2007-0001 and subsequent amendments.

Jay Sullivan, RCE #77445

Date

The Major Stormwater Management Plan (Major SWMP) must be completed in its entirety and accompany applications to the County for a permit or approval associated with certain types of development projects. To determine whether your project is required to submit a Major or Minor SWMP, please reference the County's Stormwater Intake Form for Development Projects.

Project Name:	Pacifica Estates
Project Location/Address:	Fallbrook, CA
Permit Number (Land Development Projects):	PDS2006-3100-5510
Work Authorization Number (CIP only):	
Applicant:	Jose Luis Islas
Applicant's Address:	2348 La Costa Avenue #311
	Carlsbad, CA 92009
Plan Prepared By (Leave blank if same as	RBF Consulting
applicant):	
Preparer's Address:	5050 Avenida Encinas, STE 260
	Carlsbad, CA 92008
Date:	February 2015

The County of San Diego Watershed Protection, Storm Water Management, and Discharge Control Ordinance (WPO) (Ordinance No. 9926) requires all applications for a permit or approval associated with a Land Disturbance Activity to be accompanied by a Storm Water Management Plan (SWMP) (section 67.806.b). The purpose of the SWMP is to describe how the project will minimize the short and long-term impacts on receiving water quality. Projects that meet the criteria for a priority development project are required to prepare a Major SWMP.

Since the SWMP is a living document, revisions may be necessary during various stages of approval by the County. Please provide the approval information requested below.

Project Stages	Does the SWMP need revisions?		If YES, Provide Revision Date	County Reviewer
	YES	NO	Kevision Date	Keviewer
Initial Preparation	х		June 22, 2006	
Revised	Х		August 31, 2010	
Revised per Hydromodification	Х		June 2014	
Revised per County Comments	Х		February 2015	
Revised per County Comments			March 2015	

Instructions for a Major SWMP can be downloaded at <a href="http://www.sdcounty.ca.gov/dpw/watersheds/susmp/susmp.html">http://www.sdcounty.ca.gov/dpw/watersheds/susmp/susmp.html</a>

Completion of the following checklists and attachments will fulfill the requirements of a Major SWMP for the project listed above.



## PRIORITY DEVELOPMENT PROJECT DETERMINATION

## **TABLE 1: IS THE PROJECT IN ANY OF THESE CATEGORIES?**

Yes ✓	No	A	Housing subdivisions of 10 or more dwelling units. Examples: single-family homes, multi-family homes, condominiums, and apartments.
Yes	No ✓	В	Commercial—greater than one acre (total disturbed area). Any development other than heavy industry or residential. Examples: hospitals; laboratories and other medical facilities; educational institutions; recreational facilities; municipal facilities; commercial nurseries; multi-apartment buildings; car wash facilities; mini-malls and other business complexes; shopping malls; hotels; office buildings; public warehouses; automotive dealerships; airfields; and other light industrial facilities.
Yes	No ✓	С	Heavy industry—greater than one acre (total disturbed area). Examples: manufacturing plants, food processing plants, metal working facilities, printing plants, and fleet storage areas (bus, truck, etc.).
Yes	No ✓	D	Automotive repair shops. A facility categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539.
Yes 🗖	No 🗸	E	Restaurants. Any facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC code 5812), where the land area for development is greater than 5,000 square feet. Restaurants where land development is less than 5,000 square feet shall meet all SUSMP requirements except for structural treatment BMP and numeric sizing criteria requirements and hydromodification requirements.
Yes	No ✓	F	Hillside development greater than 5,000 square feet. Any development that creates 5,000 square feet of impervious surface and is located in an area with known erosive soil conditions, where the development will grade on any natural slope that is twenty-five percent or greater.
Yes	No ✓	G	Environmentally Sensitive Areas (ESAs). All development located within or directly adjacent to or discharging directly to an ESA (where discharges from the development or redevelopment will enter receiving waters within the ESA), which either creates 2,500 square feet of impervious surface on a proposed project site or increases the area of imperviousness of a proposed project site to 10% or more of its naturally occurring condition. "Directly adjacent" means situated within 200 feet of the ESA. "Discharging directly to" means outflow from a drainage conveyance system that is composed entirely of flows from the subject development or redevelopment site, and not commingled with flows from adjacent lands.
Yes	No ✓	Н	Parking lots 5,000 square feet or more or with 15 or more (paved) parking spaces and potentially exposed to urban runoff.
Yes 🗸	No	Ι	Street, roads, highways, and freeways. Any paved surface that is 5,000 square feet or greater used for the transportation of automobiles, trucks, motorcycles, and other vehicles.
Yes	No ✓	J	Retail Gasoline Outlets (RGOs) that are: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.

To use the table, review each definition A through K. If any of the definitions match, the project is a Priority Development Project. Note some thresholds are defined by square footage of impervious area created; others by the total area of the development. Please see special requirements for previously developed sites and project exemptions on page 6 of the County SUSMP.

# STEP 2

# PROJECT STORMWATER QUALITY DETERMINATION

Total Project Site Area 17.0 (Acres or ft²)
Estimated amount of disturbed area: 13.5 (Acres or ft²) (If >1 acre, you must also provide a WDID number from the SWRCB) WDID: <u>TBD</u>
Complete A through C and the calculations below to determine the amount of impervious surface on your project before and after construction.
A. Total size of project site: 17.0 (Acres or ft <sup>2</sup> )
B. Total impervious area (including roof tops) before construction <u>0.20</u> (Acres or ft²)
C. Total impervious area (including roof tops) after construction 3.8 (Acres or ft²)
Calculate percent impervious before construction: $B/A = 1 \%$ Calculate percent impervious after construction: $C/A = 22 \%$

Please provide detailed descriptions regarding the following questions:

#### **TABLE 2: PROJECT SPECIFIC STORMWATER ANALYSIS**

### 1. Please provide a brief description of the project.

The project site is located in the community of Fallbrook within the County of San Diego, California. The project is located just northeast of the intersection of Mission Road at Stage Coach Lane (reference Thomas Bros. 1027-G7). Attachment A provides a location map for the project.

The Pacifica Estates project proposes the subdivision of 17.0-acres for a single-family residential development, open space, and common area. The development plan includes a total of 26 lots consisting of:

- a) 21 Single Family Residential lots averaging 0.5 acres each (Lots 1-21)
- b) 2- Open Space Lots for conservation of existing wetlands (Lots "A" and "C")
- c) 2- Common Area Lots for Water Quality Treatment and Hydromodification Mitigation (Lots "B" and "D)
- d) 1 Private road lot

Lots 1-21 shall serve as single-family residences. Lots "A" and "C" are to remain as open space via dedication to the County of San Diego, Fallbrook Conservation District. The open spaces will protect the existing non-native wetland areas and recommended buffer zones from future development. The remaining lots "B" and "D" will consist of common area for storm water quality treatment and hydromodification mitigation of runoff from the developed portion of the subdivision.

The site is bound on the west side by Ostrich Farm Creek and Mission Road. Along the eastern edge it is bound by Morro Road. The area within Ostrich Farm Creek is considered non-native wetland species, while the remaining portion (about 14 acres) is considered undeveloped grassy meadow.

#### 2. Describe the current and proposed zoning and land use designation.

The current project conforms to existing Zoning and General Plan designations for 0.5 acre residential lots. The currently proposed Tentative Map is subject to discretionary review and conditional approval by County of San Diego.

The project site is currently used for private residences. Existing single family residential land is located to the north and south of the project site. Prior to residential use, the site had been used for agricultural purposes.

3. Describe the pre-project and post-project topography of the project. (Show on Plan)
The topography of the site is fairly simple. A ridgeline, located approximately through proposed Lots 12, 13, 7, and 8, divides the property into two parts. Approximately 80% of the site drains from the ridge line towards Ostrich Farms Creek, while the remainder drains towards Morro Road to the east. The highest point of this part of the property is located near proposed Lot 15, at an elevation of approximately 607 feet MSL. This part of the property drains south and west over a distance of approximately 510 feet to an elevation of approximately 550 feet MSL for an average grade of approximately 11.1 percent. The remaining part of the property (approximately 3.5 acres) is east of the ridgeline. The highest point of this part of the property is located within the main ridge (see proposed Lot 13), at an elevation of approximately 600 feet MSL. This part of the property drains south and east over a distance of approximately 370 feet to an elevation of approximately 560 feet MSL for an average grade also of approximately 11.1 percent.

The site has little impervious cover under the existing condition. The project will add approximately 3.8 acres of impervious area to the project site. This estimate assumes that each residential unit will contribute 5,000 square feet of impervious area, that there will be approximately 1,200 linear feet of a 36-foot wide on-site private road with 4-foot wide sidewalks on each side, and that there will be about a 300' long 24' wide paved emergency access.

4. Describe the soil classification, permeability, erodibility, and depth to groundwater for LID and Treatment BMP consideration. (Show on Plan) If infiltration BMPs are proposed, a Geotechnical Engineer must certify infiltration BMPs in Attachment E.

No soils report has been prepared at this preliminary stage of the project. Therefore, the Soil Survey for the San Diego Area by the Soil Conservation Service (1973) forms the basis of this discussion.

Soils on the project site vary with respect to permeability and all are considered to be low to moderately erodible. The Soil Survey indicates that there are a variety of soils present on the site. Approximately 44 percent of the project site consists of SCS Hydrologic Soil Type B, primarily in the form of Fallbrook and Vista Coarse Sandy Loam soils. Placentia sandy loam, Hydrologic Soil Type D, constitutes another 41 percent. The remaining 15 percent is made up of Tujunga Sand, Hydrologic Group A, within the Ostrich Creek streambed. All the soils on the project site are considered low to moderately erodible.

5. Describe if contaminated or hazardous soils are within the project area. (Show on Plan) There are no known contaminated soils, fills, or hazardous wastes at the project site.

6. Describe the existing site drainage and natural hydrologic features. (Show on Plan).

The project site consists of a natural high point roughly 300' west of Morro Road. About 80% of the site drains to the west from this high point towards the existing wetlands adjacent to Mission Road. The remaining portion drains in an easterly direction towards Morro Road. Off-site flows to Ostrich Farms Creek enter the site from the north west tract corner and flow through the wetland areas to the south west corner. There are no known storm drain improvements on site or in close proximity to downstream receiving areas.

Dry weather flow was observed in Ostrich Farm Creek during RBF Consulting's field visit in June 2005. In this area, Ostrich Farm Creek appeared to be well defined with fair vegetation. Isolated areas of minor natural erosion were noted.

The proposed facilities managing runoff from the site include:

- Appropriate grading of pads with vegetated swales to direct runoff away from structures on the site and provided pre-treatment for storm water quality
- Storm drain systems to direct on-site runoff to the bioretention basins
- 7. Describe site features and conditions that constrain, or provide opportunities for stormwater control, such as LID features.

The selection, design and location of treatment BMPs for the proposed project relied heavily on the project-wide drainage plan. BMP alternatives were evaluated for their relative effectiveness for treating potential pollutants from the project site; technical feasibility; relative costs and benefits; and applicable legal, institutional, and other constraints. Table 12 provides a list of LID and Treatment-Control BMP alternatives and identifies the BMPs selected for the project site.

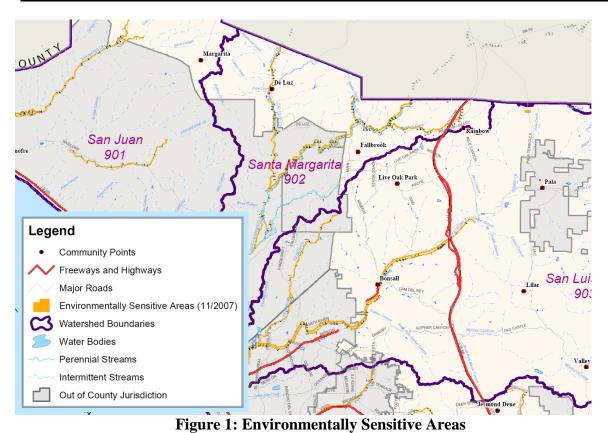
Of the treatment control options available for this project, wet ponds and constructed wetlands rely on a perennial water source, which is generally difficult to sustain in the project's arid environment. Filtration devices, such as sand filters and media filters, typically have medium to low removal efficiencies for the project's pollutants of concern. An underground sand/media filter is not recommended because of lack of space. Since the proposed project site consists of a generally flat graded pad, implementing several filters for smaller drainage areas is not feasible due to the lack of required head needed to ensure that water passes through the filter.

The Pacifica Estates project proposes implementing vegetated swales at 1% along the lot perimeter. Two bioretention basins are also proposed to provide water quality treatment and hydromodification mitigation. Riprap energy dissipaters are proposed at the discharge and concentration points within the bioretention basins.

8. Is this project within the environmentally sensitive areas as defined on the maps in Appendix A of the County of San Diego Standard Urban Storm Water Mitigation Plan for Land Development and Public Improvement Projects?

	- vinterr = vigitati
Yes	No
	✓ See Figure Below

9.	9. Is this an emergency project? If yes, please provide a description below.		
Yes No			
		✓	



(Appendix A – County of San Diego Standard Storm Water Mitigation Plan for Land Development and Public Improvement Projects)

# **CHANNELS & DRAINAGES**

Complete the following checklist to determine if the project includes work in channels.

# **TABLE 3: CHANNEL& DRAINAGE ANALYSIS**

No.	CRITERIA	YES	NO	N/A	COMMENTS
1.	Will the project include work in channels?				If YES go to 2
			✓		If NO go to 13.
2.	Will the project increase velocity or volume				If YES go to 6.
	of downstream flow?				
3.	Will the project discharge to unlined				If YES go to. 6.
	channels?				
4.	Will the project increase potential sediment				If YES go to 6.
	load of downstream flow?				
5.	Will the project encroach, cross, realign, or				If YES go to 8.
	cause other hydraulic changes to a stream				
	that may affect downstream channel				
	stability?				·
6.	Review channel lining materials and design				Continue to 7.
7	for stream bank erosion.  Consider channel erosion control measures				Continue to 8.
7.					Continue to 8.
	within the project limits as well as downstream. Consider scour velocity.				
8.	Include, where appropriate, energy				Continue to 9.
0.	dissipation devices at culverts.				Continue to 9.
9.	Ensure all transitions between culvert				Continue to 10.
).	outlets/headwalls/wingwalls and channels				Continue to 10.
	are smooth to reduce turbulence and scour.				
10.	Include, if appropriate, detention facilities				Continue to 11.
	to reduce peak discharges.				
11.	"Hardening" natural downstream areas to				Continue to 12.
	prevent erosion is not an acceptable				
	technique for protecting channel slopes,				
	unless pre-development conditions are				
	determined to be so erosive that hardening				
	would be required even in the absence of				
	the proposed development.				
12.	Provide other design principles that are				Continue to 13.
	comparable and equally effective.	✓			
13.	End				

## TEMPORARY CONSTRUCTION BMPS

Please check the construction BMPs that may be implemented during construction of the project. The applicant will be responsible for the placement and maintenance of the BMPs incorporated into the final project design.

∑ Silt Fence	Desilting Basin
∑ Fiber Rolls	Gravel Bag Berm
Street Sweeping and Vacuuming	☐ Sandbag Barrier
Storm Drain Inlet Protection	Material Delivery and Storage
∑ Stockpile Management	Spill Prevention and Control
Solid Waste Management	Concrete Waste Management
Stabilized Construction Entrance/Exit	Water Conservation Practices
Dewatering Operations	Paving and Grinding Operations
Vehicle and Equipment Maintenance	
grading permit shall be protected by cove	onstruction and not subject to a major or minor ering with plastic or tarp prior to a rain event, hed within 180 days of completion of the slope

## EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION

Complete the checklist below to determine if a proposed project will pose an "exceptional threat to water quality," and therefore require Advanced Treatment Best Management Practices during the construction phase.

**TABLE 4: EXCEPTIONAL THREAT TO WATER QUALITY DETERMINATION** 

No.	CRITERIA	YES	NO	INFORMATION
1.	Is all or part of the proposed project site within 200 feet of waters named on the Clean Water Act (CWA) Section 303(d) list of Water Quality Limited Segments as impaired for sedimentation and/or		<b>~</b>	If YES, continue to 2. If NO, go to 5.
	turbidity? Current 303d list may be obtained from the following site: <a href="http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010">http://www.waterboards.ca.gov/water_issues/programs/tmdl/2010</a> <a href="mailto:state-ir-reports/category5">state-ir-reports/category5</a> report.shtml		•	
2.	Will the project disturb more than 5 acres, including all phases of the development?			If YES, continue to 3. If NO, go to 5.
3.	Will the project disturb slopes that are steeper than 4:1 (horizontal: vertical) with at least 10 feet of relief, and that drain toward the 303(d) listed receiving water for sedimentation and/or turbidity?			If YES, continue to 4. If NO, go to 5.
4.	Will the project disturb soils with a predominance of USDA-NRCS Erosion factors k <sub>f</sub> greater than or equal to 0.4? <a href="http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm">http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm</a>			If YES, continue to 6. If NO, go to 5.
5.	Project is not required to use Advanced Treatment BMPs.	<b>✓</b>		Document for Project Files by referencing this checklist.
6.	Project poses an "exceptional threat to water quality" and is required to use Advanced Treatment BMPs.			Advanced Treatment BMPs must be consistent with WPO section 67.811(b)(20)(D) performance criteria

Exemption potentially available for projects that require advanced treatment: Project proponent may perform a Revised Universal Soil Loss Equation, Version 2 (RUSLE 2), Modified Universal Soil Loss Equation (MUSLE), or similar analysis that demonstrates (to the County official's satisfaction) that advanced treatment is not required.



# **HYDROMODIFICATION DETERMINATION**

The following questions provide a guide to collecting information relevant to hydromodification management plan (HMP) issues. If the project is exempt from the HMP criteria, please provide the supporting documentation in Attachment H. Please reference the full descriptions of the HMP exemptions located in Figure 1-1 of the County SUSMP.

**TABLE 5: HYDROMODIFICATION DETERMINATION** 

	QUESTIONS	YES	NO	Information
1.	Will the project reduce the pre-project impervious area and are the unmitigated post-project outflows (outflows without detention routing) to each outlet location less as compared to the pre-project condition?		1	If NO, continue to 2. If YES, go to 7.
2.	Would the project site discharge runoff directly to an exempt receiving water, such as the Pacific Ocean, San Diego Bay, an exempt reservoir, or a tidally-influenced area?		<b>~</b>	If NO, continue to 3. If YES, go to 7.
3.	Would the project site discharge to a stabilized conveyance system, which has the capacity for the ultimate Q <sub>10</sub> , and extends to the Pacific Ocean, San Diego Bay, a tidally-influenced area, an exempt river reach or reservoir?		✓	If NO, continue to 4. If YES, go to 7.
4.	Does the contributing watershed area to which the project discharges have an impervious area percentage greater than 70 percent?		<b>✓</b>	If NO, continue to 5. If YES, go to 7.
5.	Is this an urban infill project which discharges to an existing hardened or rehabilitated conveyance system that extends beyond the "domain of analysis," where the potential for cumulative impacts in the watershed are low, and the ultimate receiving channel has a "Low" susceptibility to erosion as defined in the SCCWRP channel assessment tool?		<b>~</b>	If NO, continue to 6. If YES, go to 7.
6.	Project is required to manage hydromodification impacts.	,	<i>'</i>	Reference Appendix G "Hydromodification Management Plan" of the County SUSMP.
7.	Project is not required to manage hydromodification impacts.			Hydromodification Exempt. Keep on file.



#### POLLUTANTS OF CONCERN DETERMINATION

## **WATERSHED**

Please check the watershed(s) for the project.

San Juan 901	Santa Margarita 902	San Luis Rey 903	Carlsbad 904
San Dieguito 905	Penasquitos 906	San Diego 907	Sweetwater 909
Otay 910	Tijuana 911	Whitewater 719	Clark 720
☐ West Salton 721*	Anza Borrego 722*	☐ Imperial 723*	

http://www.waterboards.ca.gov/sandiego/water\_issues/programs/basin\_plan/index.shtml

## HYDROLOGIC SUB-AREA NAME AND BASIN NUMBER(S)

Basin Number	Sub-Area Name
903.12	Bonsall (HSA 903.12)

http://www.waterboards.ca.gov/sandiego/water\_issues/programs/basin\_plan/index.shtml

# **RECEIVING WATERS** that each project discharge point proposes to discharge to.

RECEIVING WATERS (river, lake, reservoir, etc.)	Hydrologic Unit Basin Number	Impairment(s) listed [303(d) listed waters or waters with established TMDLs ]. List the impairments identified in <b>Table 7</b> .	Distance to Project
Ostrich Farms Creek	903.00	None	0.5 miles

http://www.waterboards.ca.gov/water\_issues/programs/tmdl/docs/303dlists2006/epa/r9\_06\_303d\_reqtmdl s.pdf

## **GROUND WATERS**

Ground Waters	Hydrologic Unit Basin Number	MUN	AGR	IND	PROC	GWR	FRESH
Lower San Luis Rey	903.10	•	•	•			

http://www.waterboards.ca.gov/sandiego/water\_issues/programs/basin\_plan/index.shtml

<sup>\*</sup>Projects located fully within these watersheds require only a Minor SWMP.

<sup>+</sup> Excepted from Municipal

<sup>•</sup> Existing Beneficial Use

O Potential Beneficial Use

# PROJECT ANTICIPATED AND POTENTIAL POLLUTANTS

Using Table 6, identify pollutants that are anticipated to be generated from the proposed priority project categories. Pollutants associated with any hazardous material sites that have been remediated or are not threatened by the proposed project are not considered a pollutant of concern.

TABLE 6: ANTICIPATED AND POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE

	General Pollutant Categories									
PDP Categories	Sediments	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides	
Detached Residential Development	х	Х			Х	х	Х	Х	Х	
Attached Residential Development	Х	х			Х	P <sup>(1)</sup>	P <sup>(2)</sup>	Р	Х	
Commercial Development 1 acre or greater	P <sup>(1)</sup>	P <sup>(1)</sup>		P <sup>(2)</sup>	Х	P <sup>(5)</sup>	Х	P <sup>(3)</sup>	P <sup>(5)</sup>	
Heavy industry /industrial development	Х		Х	Х	х	х	Х			
Automotive Repair Shops			Х	X <sup>(4)(5)</sup>	Х		Х			
Restaurants					Х	Х	Х	Х		
Hillside Development >5,000 ft <sup>2</sup>	Х	х			Х	Х	Х		Х	
Parking Lots	P <sup>(1)</sup>	P <sup>(1)</sup>	Х		Х	P <sup>(1)</sup>	Х		P <sup>(1)</sup>	
Retail Gasoline Outlets			Х	Х	Х	Х	Х			
Streets, Highways & Freeways	Х	P <sup>(1)</sup>	Х	X <sup>(4)</sup>	Х	P <sup>(5)</sup>	Х			

X = anticipated

P = potential

- (1) A potential pollutant if landscaping exists on-site.
- (2) A potential pollutant if the project includes uncovered parking areas.
- (3) A potential pollutant if land use involves food or animal waste products.
- (4) Including petroleum hydrocarbons.
- (5) Including solvents.

# PROJECT POLLUTANTS OF CONCERN SUMMARY TABLE

Please summarize the identified project pollutants-of-concern by checking the appropriate boxes in the table below and list any surface water impairments identified. Pollutants anticipated to be generated by the project, which are also causing impairment of receiving waters, shall be considered the primary pollutants of concern. For projects where no primary pollutants of concern exist, those pollutants identified as anticipated shall be considered secondary pollutants of concern.

**TABLE 7: PROJECT POLLUTANTS OF CONCERN** 

Pollutant Category	Anticipated (X)	Potential (P)	Surface Water Impairments (determined by your receiving waters impairments on page 10)
Sediments	X		N/A
Nutrients	X		Phosphorus, Total Nitrogen as N,
Heavy Metals	X		Selenium
Organic Compounds	X		N/A
Trash & Debris	X		N/A
Oxygen Demanding Substances	X		Dissolved Oxygen
Oil & Grease	X		N/A
Bacteria & Viruses	X		Enterococcus, Fecal Coliform
Pesticides	X		TDS, Polychlorinated Biphenyls (PCBs)

# STEP 5

## **LID AND SITE DESIGN STRATEGIES**

Each numbered item below is a Low Impact Development (LID) requirement of the WPO. Please check the box(s) under each number that best describes the LID BMP(s) and Site Design Strategies selected for this project. LID BMPs selected on this table will be typically represented as a self-retaining area, self-treating area, pervious pavement and greenroof, which, should be delineated in the Drainage Management Area map in Attachment C.

#### **TABLE 8: LID AND SITE DESIGN**

1.	Conserve natural Areas, Soils, and Vegetation
	Preserve well draining soils (Type A or B)
	Preserve Significant Trees
	Preserve critical (or problematic) areas such as floodplains, steep slopes, wetlands, and areas with erosive or unstable soil conditions
	Other. Description:
2.	Minimize Disturbance to Natural Drainages
	Set-back development envelope from drainages
	Restrict heavy construction equipment access to planned green/open space areas
	Other. Description:
3.	Minimize and Disconnect Impervious Surfaces (see 5)
	Clustered Lot Design
	☐ Items checked in 5
	Other. Description:
4.	Minimize Soil Compaction
	Restrict heavy construction equipment access to planned green/open space areas
	Re-till soils compacted by construction vehicles/equipment
	Collect & re-use upper soil layers of development site containing organic Materials
	Other. Description:
5.	Drain Runoff from Impervious Surfaces to Pervious Areas
	LID Street & Road Design
	Curb-cuts to landscaping
	Rural Swales
	Concave Median
	Cul-de-sac Landscaping Design
	Other. Description: Curb-cuts to bioretention areas.

LID I	Parking Lot Design
	Permeable Pavements
	Curb-cuts to landscaping
	Other. Description: Not applicable.
LID I	Driveway, Sidewalk, Bike-path Design
$\boxtimes$	Permeable Pavements
$\boxtimes$	Pitch pavements toward landscaping
	Other. Description:
<u>LID I</u>	Building Design
	Cisterns & Rain Barrels
	Downspout to swale or landscaping
	Vegetated Roofs
	Other. Description:
LID I	Landscaping Design
$\boxtimes$	Soil Amendments
	Reuse of Native Soils
	Smart Irrigation Systems
	Street Trees
	Other. Description:
6. Minimiz	ze erosion from slopes
$\boxtimes$	Disturb existing slopes only when necessary
	Minimize cut and fill areas to reduce slope lengths
$\boxtimes$	Incorporate retaining walls to reduce steepness of slopes or to shorten slopes
	Provide benches or terraces on high cut and fill slopes to reduce concentration
of flo	
$\boxtimes$	Rounding and shaping slopes to reduce concentrated flow
	Collect concentrated flows in stabilized drains and channels
	Other. Description:

# STEP 6

#### SOURCE CONTROL

Please complete the checklist on the following pages to determine Source Control BMPs. Below is instruction on how to use the checklist. (Also see instructions on page 60 of the *SUSMP*)

- 1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies and list in Table 9.
- 2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your Source Control Exhibit in Attachment B.
- 3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs into Table 9.
- 4. Use the format in Table 9 below to summarize the project Source Control BMPs. Incorporate all identified Source Control BMPs in your Source Control Exhibit in Attachment B.

#### **TABLE 9: PROJECT SOURCE CONTROL BMPS**

Potential source of runoff pollutants	Permanent source control BMPs	Operational source control BMPs
A. On-site storm drain inlets.	Mark all inlets with the word "No Dumping! Flows to Bay" or similar.	<ol> <li>Maintain and periodically repaint and replace inlet markings</li> <li>Provide stormwater pollution prevention information to new site owners, lessees, or operators.</li> <li>See Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbook.</li> </ol>
D2. Landscape/ Outdoor Pesticide Use	<ol> <li>Preserve existing native trees, shrubs, and ground cover to the maximum extend possible.</li> <li>Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.</li> <li>Consider using pest-resistant plans, especially adjacent to hardscape.</li> <li>To insure successful establishment, select plans appropriate to site soils, slops, climate, sun, wind, rain, land use, air movement, ecological</li> </ol>	<ol> <li>Maintain landscaping using minimum or no pesticides.</li> <li>See Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbook.</li> <li>Provide IPM information to new owners, lessees and operators.</li> </ol>

Wash Water	Minimize use of pesticides and fertilizers for maintaining the landscaping.
P. Plaza, sidewalks and parking lots.	1. Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degrease shall be collected end discharged to the sanitary sewer and not discharge to a storm drain.

Describe your specific Source Control BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting Source Control BMPs or substituting alternatives.

The Source Control BMPs for the proposed project have been selected from the Source Control BMP checklist (pg.24-38). The checklist is based on the potential sources of runoff pollutants. For the project activities, on-site storm drain inlets have been identified as a potential source of runoff pollutants, as well as landscape/outdoor pesticide use, roofing materials and sidewalk areas. The proposed Source Control BMPs have been selected to limit the adverse impacts of these potential sources. Source Control BMPs are as follows:

- All new storm drain inlets/catch basins that are constructed as part of this project will be labeled with the message "No Dumping Drains to Ocean" or equivalent message as directed by the City. All such labels will be maintained in a legible condition.
- The project includes efficient landscape design, which includes grouping of plants with similar water requirements to reduce excess irrigation runoff and promote surface infiltration. The landscape design also maximizes the use of non-invasive native plant species and plants with low water requirements when possible. The landscape irrigation system will use programmable timers and include automatic valves to shut-off water in case of rapid pressure drop (indicating possible water leaks).
- Roofing material will not be made of copper or other unprotected metals that may leach into stormwater runoff.
- Sidewalks shall be swept regularly to prevent the accumulation of litter and debris.
- Last, a homeowner outreach program and "on-lot treatment" will be used as a Source Control BMP. More detail is provided above Table 9 in regards to the homeowner outreach program and "on-lot treatment" requirements and expectations.

#### Basic Homeowner Outreach Program

As stated above, one source-control best management practice for residential sites is pollution prevention outreach. The key to a successful outreach campaign is to target a message to a specific audience, such as homeowners. At the sale of the property or lease- signing, the homeowner or tenant will be presented with a brochure to encourage them to develop and implement source-control best management practices. Another strategy is to attach brochures as non-binding but informative parts of private road maintenance or structural BMP maintenance agreements used for ensuring the maintenance of the structural treatment control measures. Primary areas of source-control BMP for homeowners include:

Lawn and Garden Activities. Lawn and garden activities can result in contamination of storm water through pesticide, soil, and fertilizer runoff. Proper landscape management, however, can effectively reduce water use and contaminant runoff and enhance the aesthetics of a property. Environmentally friendly landscape management can protect the environment through careful planning and design, routine soil analysis, appropriate plant selection, use of practical turf areas, water use efficiency, use of mulches, and appropriate maintenance. Additional activities that benefit water resources include maintaining healthy plants and lawns and composting lawn wastes. Healthy

plants are less susceptible to diseases and insects and therefore require minimal use of pest control measures. To promote healthy plants, it is often beneficial to till composted material into the soil. Recycling of garden wastes by composting is also effective at reducing waste, although compost bins and piles should not be located next to waterways or storm drains because leachate from compost materials can cause contamination.

**Water Conservation Practices.** By making minor changes in water use habits, each household can reduce its water consumption while saving money on water and sewage bills. Homeowners can be made aware of practices like checking regularly for plumbing leaks and checking for water leaks by monitoring their water meters when no water is being used (such as when they go on vacation).

**Pet Waste Management.** When pet waste is not properly disposed of, it can wash into nearby water bodies or can be carried by runoff into storm drains. Homeowners should be encouraged to dispose of pet waste with regular trash, bury it in their yards, or flush it down the toilet. San Diego County prefers that pet waste be flushed down the drain. Alternatives to flushing include placing pet waste in the trash or burying it at least 3 feet in the ground.

**Trash Management.** Homeowners should be informed about their options for recycling and waste disposal, as well as the consequences of littering. It is especially important to inform residents of proper disposal procedures for household hazardous wastes.

#### "On-Lot Treatment"

"On-lot treatment" describes a series of practices designed to treat runoff from individual residential lots. Their primary purpose is to manage rooftop, driveway and sidewalk runoff. Managing runoff from these sources helps to disconnect impervious surfaces and to reduce the effect of increased impervious cover in a watershed. The project anticipates using landscaped areas and vegetated swales on each lot to treat runoff.

With few exceptions, some sort of on-lot treatment can be applied to almost all sites. However, while on-site treatment of residential storm water runoff has been encouraged, it has not generally been an option to meet storm water requirements. This practice is changing, as municipalities and other storm water regulators realize the value of these treatment processes. According to the EPA, there are currently at least two jurisdictions that offer "credits" in exchange for the application of on-site storm water management practices. In Denver, Colorado, sites designed with methods to reduce "directly connected impervious cover" are permitted to use a lower site impervious area when computing the required storage of storm water facilities. Likewise, in Maryland, new regulations allow designers to subtract each rooftop that is disconnected from the total site impervious cover when calculating required storage in storm water management practices.

#### A. Project Location

Roof leaders will be used on all homes built within the proposed project. Runoff will also be diverted to a pervious area or to a treatment area on each individual lot using site grading, channels or berms, as opposed to flowing directly to the street and thus to the storm drain system. Cisterns and rain barrels, practices that store rooftop runoff, may be used at the discretion of the individual homeowners.

## B. Siting and Design Considerations

Although most residential lots can incorporate on-lot treatment, the best option for a site depends on both site design constraints and the preferences of the homeowner. Bioretention and vegetated swales need to meet the siting requirements of those practices. The use of cisterns and rain barrels has far fewer site constraints. However, for this practice to be effective, homeowners must have a use for the stored water. These practices are therefore best suited to homeowners who have some active interest in gardening or landscaping.

Although these practices are simple compared with many other post-construction storm water practices, the designs need to incorporate the same basic elements of any other storm water practice. Pretreatment is important to ensure that these practices, such a roof leaders, do not become clogged with leaf debris. Rain barrels and cisterns should also incorporate some sort of pretreatment, such as a mesh filter at the top of the barrel or cistern.

Storage practices should also typically incorporate some type of bypass so that larger storms flow away from the house. In rain barrels or cisterns, this bypass may be a hose set at a high level of the practice and directed away from the practice and building foundation. For vegetated swales and bioretention, an on-line design directs all flows to the management practice, but larger flows generally flow over the practice and are not treated.

## C. Maintenance Requirements

Bioretention areas, filter strips, and vegetated swales require regular maintenance to ensure that the vegetation remains in good condition. Rain barrels and cisterns require minimal maintenance, but the homeowner needs to ensure that the tank is cleaned out approximately once per year.

#### D. Pollutant Removal

Although the practices used for on-lot applications can have relatively high pollutant removals, it is not clear that these pollutant removal rates can be realized with the relatively low pollutant concentrations entering the practices. One clearly recognizable benefit of many on-lot practices, however, is that they generally promote ground water recharge, either directly through infiltration or indirectly by applying or directing runoff to pervious areas.

#### E. Cost Considerations

The cost burden of on-lot practices is generally born directly by homeowners. However, homeowners can reduce costs for many of these practices by making their own on-lot practice rather than purchasing a commercial product, and maintenance costs are essentially free.

# BASIC HOMEOWNER OUTREACH PROGRAM

Do not dispose of liquids or other materials to the storm drain system
Report illegal dumping of any substance (liquids, trash, household toxics) to the County's toll free, 24-hour hotline 1-888-846-0800
Utilize the County Household Toxics Program at (800) 246-1233, for disposal of household toxics
Keep lawn clippings and other landscaping waste out of gutters and streets by placing it with trash for collection or by composting it
Clean up and properly dispose of pet waste. It is best to flush pet waste. Alternatives to flushing are placing into trash or burying it in your yard (at least 3-ft deep).
Observe parking restriction for street sweeping.
Wash automobiles at car washes or on pervious surfaces (lawns) to keep wash water out of the storm drain system.
Avoid excessive or improper use or disposal of fertilizers, pesticides, herbicides, fungicides, cleaning solutions, and automotive and paint products.
Use biodegradable, non-toxic, and less toxic alternative products to the extent possible.
Cover garbage containers and keep them in good repair.
Sweep sidewalks instead of hosing down.
Water lawn properly to reduce runoff.

Source: www.co.san-diego.ca.us/deh/stormwater/residential.html

IF THESE SOURCES WILL BE ON THE PROJECT SITE  1 Potential Sources of Runoff Pollutants – List in Table 9		THEN YOUR STORMWATE	R CO	NTROL PLAN SHOULD INCLUDE TH	ESE	SOURCE CONTROL BMPs
		2 Permanent Controls—Show on Source Control Exhibit, Attachment B		3 Permanent Controls—List in Table 9 and Narrative		4 Operational BMPs—Include in Table 9 and Narrative
<b>*</b>	A. On-site storm drain inlets	✓ Locations of inlets.	*	Mark all inlets with the words "No Dumping! Flows to Bay" or similar.		Maintain and periodically repaint or replace inlet markings.  Provide stormwater pollution prevention information to new site owners, lessees, or operators.  See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com  Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
	<b>B.</b> Interior floor drains and elevator shaft sump pumps			State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.		Inspect and maintain drains to prevent blockages and overflow.
	C. Interior parking garages			State that parking garage floor drains will be plumbed to the sanitary sewer.		Inspect and maintain drains to prevent blockages and overflow.
	<b>D1.</b> Need for future indoor & structural pest control			Note building design features that discourage entry of pests.		Provide Integrated Pest Management information to owners, lessees, and operators.

IF THESE SOURCES WILL BE ON THE PROJECT SITE	THEN YOUR STORMWATER	R CONTROL PLAN SHOULD INCLUDE TH	ESE SOURCE CONTROL BMPs		
1 Potential Sources of Runoff Pollutants – List in Table 9	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in Table 9 and Narrative	4 Operational BMPs—Include in Table 9 and Narrative		
✓ D2. Landscape/ Outdoor Pesticide Use  Note: Should be consistent with project landscape plan (if applicable).	<ul> <li>✓ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.</li> <li>✓ Show self-retaining landscape areas, if any.</li> <li>✓ Show stormwater treatment facilities.</li> </ul>	State that final landscape plans will accomplish all of the following:  Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.  Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.  Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.  Consider using pest-resistant plants, especially adjacent to hardscape.  To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	<ul> <li>✓ Maintain landscaping using minimum or no pesticides.</li> <li>✓ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at <a href="https://www.cabmphandbooks.com">www.cabmphandbooks.com</a></li> <li>✓ Provide IPM information to new owners, lessees and operators.</li> </ul>		

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■ E. Pools, spas, ponds, decorative fountains, and other water features.	Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
☐ F. Food service	□ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. □ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	<ul> <li>Describe the location and features of the designated cleaning area.</li> <li>Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.</li> </ul>	

IF THESE SOURCES WILL BE ON THE PROJECT SITE	THEN YOUR STORMWATER CONTROL PLAN SHOULD INCLUDE THESE SOURCE CONTROL BMPs			
1 Potential Sources of Runoff Pollutants – List in Table 9	2 Permanent Controls—Show on Source Control Exhibit, Attachment B	3 Permanent Controls—List in Table 9 and Narrative	4 Operational BMPs—Include in Table 9 and Narrative	
☐ G. Refuse areas	□ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. □ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent runon and show locations of berms to prevent runoff from the area. □ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	<ul> <li>State how site refuse will be handled and provide supporting detail to what is shown on plans.</li> <li>State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.</li> </ul>	□ State how the following will be implemented:  Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available onsite. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com	
☐ H. Industrial processes.	☐ Show process area.	☐ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	☐ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com	

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□ I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	<ul> <li>□ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent runon or run-off from area.</li> <li>□ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.</li> <li>□ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.</li> </ul>	<ul> <li>□ Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.         Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for:         <ul> <li>■ Hazardous Waste Generation</li> <li>■ Hazardous Materials Release Response and Inventory</li> <li>■ California Accidental Release (CalARP)</li> <li>■ Aboveground Storage Tank</li> <li>■ Uniform Fire Code Article 80 Section 103(b) &amp; (c) 1991</li> <li>■ Underground Storage Tank</li> </ul> </li> <li>■ Underground Storage Tank</li> </ul>	See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com	

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D1. Need for future indoor & structural pest control		☐ Note building design features that discourage entry of pests.	☐ Provide Integrated Pest Management information to owners, lessees, and operators.	

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D2. Landscape/ Outdoor Pesticide Use  Note: Should be consistent with project landscape plan (if applicable).	<ul> <li>□ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.</li> <li>□ Show self-retaining landscape areas, if any.</li> <li>□ Show stormwater treatment facilities.</li> </ul>	State that final landscape plans will accomplish all of the following:  Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.  Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.  Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.  Consider using pest-resistant plants, especially adjacent to hardscape.  To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	□ Maintain landscaping using minimum or no pesticides. □ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com □ Provide IPM information to new owners, lessees and operators.	

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■ E. Pools, spas, ponds, decorative fountains, and other water features.	Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	☐ If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	☐ See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com	
☐ F. Food service	<ul> <li>□ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.</li> <li>□ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.</li> </ul>	<ul> <li>Describe the location and features of the designated cleaning area.</li> <li>Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.</li> </ul>		

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☐ <b>G.</b> Refuse areas	□ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. □ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent runon and show locations of berms to prevent runoff from the area. □ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	<ul> <li>□ State how site refuse will be handled and provide supporting detail to what is shown on plans.</li> <li>□ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.</li> </ul>	□ State how the following will be implemented:  Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available onsite. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
☐ <b>H.</b> Industrial processes.	☐ Show process area.	☐ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	☐ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

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I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	<ul> <li>□ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent runon or run-off from area.</li> <li>□ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.</li> <li>□ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.</li> </ul>	☐ Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.  Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for:  ' Hazardous Waste Generation  ' Hazardous Materials Release Response and Inventory  ' California Accidental Release (CalARP)  ' Aboveground Storage Tank  ' Uniform Fire Code Article 80 Section 103(b) & (c) 1991  ' Underground Storage Tank	See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com	

		T	
J. Vehicle and Equipment Cleaning	☐ Show on drawings as appropriate:  (1) Commercial/industrial facilities having vehicle /equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.  (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shutoff to discourage such use).  (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.  (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	☐ If a car wash area is not provided, describe measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable):  □ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.  □ Car dealerships and similar may rinse cars with water only.  ✓ See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

■ K. Vehicle/ Repair and Maintenand	equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of		State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.  State that there are no floor drains or if	In the SUSMP report, note that all of the following restrictions apply to use the site:  No person shall dispose of, nor permit the disposal directly or
	exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.	_	there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.  State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.  No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.  No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.

☐ L. Fuel Dispensing Areas	Fueling areas¹ shall have impermeable floors (i.e., portland	The property owner shall dry sweep the fueling area routinely.
	cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.	See the Business Guide Sheet, "Automotive Service—Service Stations" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
	Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area <sup>1</sup> .] The canopy [or cover] shall not drain onto the fueling area.	

<sup>&</sup>lt;sup>1</sup> The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

■ M. Loading Docks	Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible.  Direct connections to storm drains from depressed loading docks are prohibited.  Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.  Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		□ Move loaded and unloaded items indoors as soon as possible. □ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
■ N. Fire Sprinkler Test Water		Provide a means to drain fire sprinkler test water to the sanitary sewer.	☐ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

	O. Miscellaneous Drain or Wash Water Boiler drain lines		Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.	
0	Condensate drain lines  Rooftop equipment		Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not	
	Drainage sumps		discharge to the storm drain system.	
	Roofing, gutters, and trim.	0	Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment.	
			Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.	
		<b>/</b>	Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	
<b>✓</b>	P. Plazas, sidewalks, and parking lots.			Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.



#### LID AND TREATMENT CONTROL SELECTION

A treatment control BMP and/or LID IMP must be selected to treat the project pollutants of concern identified in Table 7 "Project Pollutants of Concern". A treatment control facility with a high or medium pollutant removal efficiency for the project's most significant pollutant of concern shall be selected. It is recommended to use the design procedure in Chapter 4 of the SUSMP to meet NPDES permit LID requirements, treatment requirements, and flow control requirements. If your project does not utilize this approach, the project will need to demonstrate compliance with LID, treatment and hydromodification flow control requirements. Review Chapter 2 "Selection of Stormwater Treatment Facilities" in the SUSMP to assist in determining the appropriate treatment facility for your project.

Will this project be utilizing the unified LID design procedure as described in Chapter 4 of the Local SUSMP? (If yes, please document in Attachment D following the steps in Chapter 4 of the County SUSMP)					
Yes	No				
✓					
If this project is not utilizing the unified LID design procedure, please describe how the alternative treatment facilities will comply with applicable LID criteria, stormwater treatment criteria, and hydromodification management criteria.					

Indicate the project pollutants of concern (POCs) from Table 7 in Column 2 below.

TABLE 10: GROUPING OF POTENTIAL POLLUTANTS of Concern (POCs) by fate during stormwater treatment

Pollutant	Check	Coarse Sediment and Trash	Pollutants that tend	Pollutants that tend
	Project		to associate with	to be dissolved
	Specific		fine particles during	following treatment
	POCs		treatment	
Sediment	X	X	X	
Nutrients	X		X	X
Heavy Metals	X		X	
Organic Compounds	X		X	
Trash & Debris	X	X		
Oxygen Demanding	X		X	
Bacteria	X		X	
Oil & Grease	X		X	
Pesticides	X		X	

Indicate the treatment facility(s) chosen for this project in the following table.

**TABLE 11: GROUPS OF POLLUTANTS and relative effectiveness of treatment facilities** 

Pollutants of	Bioretention	Settling	Wet Ponds	Infiltration	Media	Higher-	Higher-	Trash Racks	Vegetated
Concern	Facilities	Basins	and	Devices	Filters	rate	rate	& Hydro	Swales
	(LID)	(Dry	Constructed	(LID)		biofilters	media	-dynamic	
		Ponds)	Wetlands				filters	Devices	
Coarse	High	High	High	High	High	High	High	High	High
Sediment									_
and Trash									
Pollutants	High	High	High	High	High	Medium	Medium	Low	Medium
that tend to		_	_	_	_				
associate									
with fine									
particles									
during									
treatment									
Pollutants	Medium	Low	Medium	High	Low	Low	Low	Low	Low
that tend to				_					
be dissolved									
following									
treatment									

Please check the box(s) that best describes the Treatment Control BMP(s) and/or LID IMP selected for this project. Please check if the treatment facility is designed for water quality or hydromodification flow control. Check both boxes if the facility is designed for both water quality and hydromodification flow control.

TABLE 12: PROJECT TCBMPS - BMPs designed to treat stormwater (e.g., LID and hydromod) shall be considered TCBMPs.

TCBMP Type	Water Quality Treatment	Hydromodification Flow Control
Bioretention Facilites (LID)		
Bioretention area	Х	Х
Flow-through Planter		
Cistern with Bioretention		
Basins		
Extended/dry detention basin with grass/vegetated lining		
Extended/dry detention basin with impervious lining		
Underground vault		
Cistern		
Infiltration Devices (LID)		

	Infiltration basin		
	Infiltration trench		
	Other		
W	et Ponds and Constructed Wetlands		
	Wet pond/basin (permanent pool)		
	Constructed wetland		
V	egetated Swales (LID <sup>(1)</sup> )		
$\boxtimes$	Vegetated Swale	Χ	X
M	edia Filters		
	Austin Sand Filter		
	Delaware Sand Filter		
	Multi-Chambered Treatment Train (MCTT)		
Н	igher-rate Biofilters		
	Tree-pit-style unit		
	Other		
Н	igher-rate Media Filters		
	Vault-based filtration unit with		
re	placeable cartridges		
	Other		
Н	ydrodynamic Separator Systems		
	Swirl Concentrator		
	Other		
T	rash Racks		
	Catch Basin Insert		
	Catch Basin Insert w/ Hydrocarbon boom		
	Other		
Se	elf-Retaining Areas (LID)		
$\boxtimes$	Permeable Pavements (easterly access road)	X	X
	Self-Retaining		
	Vegetated Roof		

For design guidelines and calculations refer to Chapter 4 "Low Impact Development Design Guide" in the SUSMP. Please show all calculations and design sheets for all treatment control BMPs proposed in Attachment D.

<sup>&</sup>lt;sup>(1)</sup> Must be designed per SUSMP "Vegetated Swales" design criteria for water quality treatment credit (p. 102-103).

> Create a Construction Plan SWMP Checklist for your project.

Instructions on how to fill out table

- 1. Number and list each measure or BMP you have specified in your SWMP in Columns 1 and Maintenance Category in Column 3 of the table. Leave Column 2 blank.
- 2. When you submit construction plans, duplicate the table (by photocopy or electronically). Now fill in Column 2, identifying the plan sheets where the BMPs are shown. List all plan sheets on which the BMP appears. **This table must be shown** on the front sheet of the grading and improvement plans.

Treatment Control BMPs <sup>1</sup>					
Description / Type	Sheet	Maintenance Category	Revisions		
Vegetated Swales		1			
Bioretention Basins		2			
Riprap Energy Dissipaters (Site/Source Control)		2			
Permeable Pavement		2			
<sup>1</sup> BMPs designed to treat stormwater (e.g., LID and hydromod) shall be considered TCBMPs.					

<sup>\*</sup>BMP's approved as part of Stormwater Management Plan (SWMP) dated xx/xx/xx on file with DPW. Any changes to the above BMP's will require SWMP revision and Plan Change approvals.

Please describe why the chosen treatment control BMP(s) was selected for this project. For projects utilizing a low performing BMP, please provide a **feasibility analysis** that demonstrates utilization of a treatment control BMP with a high or medium removal efficiency ranking is infeasible.

The selection, design and location of treatment BMPs for the proposed project relied heavily on the project-wide drainage plan. BMP alternatives were evaluated for their relative effectiveness for treating potential pollutants from the project site; technical feasibility; relative costs and benefits; and applicable legal, institutional, and other constraints. Table 12 provides a list of LID and Treatment-Control BMP alternatives and identifies the BMPs selected for the project site.

Of the treatment control options available for this project, wet ponds and constructed wetlands rely on a perennial water source, which is generally difficult to sustain in the project's arid environment. Filtration devices, such as sand filters and media filters, typically have medium to low removal efficiencies for the project's pollutants of concern. An underground sand/media filter is not recommended because of lack of space. Since the proposed project site consists of a generally flat graded pad, implementing several filters for smaller drainage areas is not feasible due to the lack of required head needed to ensure that water passes through the filter.

The Pacifica Estates project proposes implementing vegetated swales at 1% along the lot perimeter. Bioretention basins are also proposed to provide both water quality treatment and hydromodification mitigation. Riprap energy dissipaters are proposed at the discharge and concentration points within the proposed bioretention basins.

#### **Vegetated Swales**

Nutrients are inorganic substances, such as nitrogen and phosphorus, and primary sources of nutrients in urban runoff are fertilizers and eroded soils. The proposed project includes slope areas that will be vegetated to reduce the potential for soil erosion. Landscaped areas between the residential homes will be depressed and vegetated to form swales, which will also reduce soil erosion as well as provide opportunity for nutrient uptake by planted material. The swales have been sized according to the recommendations of the 2003 California New Development BMP Handbook, Fact Sheet TC-30 (refer to Appendix B for sizing calculations). (Refer to Attachment D for design calculations).

#### **Bioretention Areas**

The project proposes bioretention which will benefit both hydromodification mitigation and water quality. Because of the type D soils, bioretention areas are expected to include a sub-grade side wall impermeable liner to prevent lateral migration of runoff, a subgrade section of 24-inches of gravel, 18-inches of engineering media, and a 1-foot of 100% voids (ponding area), and perforated sub-drains.

Please provide the sizing design calculations for each Drainage Management Area in Attachment D. Guidelines for design calculations are located in Chapter 4 of the County SUSMP. To assist in these calculations a BMP sizing calculator is available for use at the following location: <a href="http://www.projectcleanwater.org/html/wg\_susmp.html">http://www.projectcleanwater.org/html/wg\_susmp.html</a>

#### STEP 8

#### **OPERATION AND MAINTENANCE**

Please check the box that best describes the maintenance mechanism(s) for this project. The recorded maintenance agreement shall be included in the Maintenance Plan for this project (Attachment F).

**TABLE 13: PROJECT BMP CATEGORY** 

CATEGORY	SELECTED		BMP Description
CATEGORI	YES	NO	
First <sup>1</sup>	Х		Vegetated swales*
Second <sup>2</sup>			Bioretention Areas
	X		Riprap Energy Dissipators Permeable Paevment
Third <sup>3</sup>		X	
Fourth <sup>4</sup>		X	

#### Note:

- 1. A maintenance notification will be required.
- 2. A recorded maintenance agreement and access easement will be required.
- 3. The project will be required to establish or be included in a watershed specific Community Facility District (CFD) for long-term maintenance.
- 4. The developer would be required to dedicate the BMP (and the property on which it is located and any necessary access) to the County.

Individual homeowners and the HOA are responsible for maintenance of all proposed BMPs. On lot swales will be maintained by individual homeowners, primarily through mowing and maintaining grass/vegetative cover. The HOA will cover the cost to have the detention basin and riprap energy dissipaters inspected and maintained per the maintenance schedule.

As defined by San Diego County, First Category is described as those BMPs what the County should have only minimal concern for ongoing maintenance. The proposed BMPs inherently "take care of themselves", or property owners can naturally be expected to do so as an incident of taking care of their property. Second Category is defined as BMPs which the County needs to assure ongoing maintenance. The nature of the proposed BMPs indicates that it is appropriate for property owners to retain primary responsibility for maintenance on a perpetual. However, the County (in a "backup" role) needs to be able to step in and perform the maintenance if property the owner fails to; the County requires financial security to provide funding for such backup maintenance. A security deposit will be provided to the County to substantiate the maintenance agreement, which would remain in place for an interim period of five years. The amount of the security would equal the estimated cost of 2 years of maintenance activities.

<sup>\*</sup> Vegetated swales require minimal maintenance and in this case are located on private property, and they are best designated as Category 1 facilities, and therefore will not require a funding mechanism.

Please list all individual Treatment Control BMPs (TCBMPs) incorporated into the project. Please attach the record plan sheets upon completion of project and amend the Major SWMP where appropriate. For each type of TCBMP provide an inspection sheet in Attachment F "Maintenance Plan". Replicate Table 14 in Attachment G once the TCBMP has been constructed.

**TABLE 14: PROJECT SPECIFIC LID AND TCBMPS** 

Treatment Control BMPs (TCBMPs) <sup>1,2</sup> (List all from SWMP)					
Lot Number Or Location	Description/Type	Sheet			
	Vegetated Swales				
	Bioretention Basins				
	Permeable Pavement				

<sup>&</sup>lt;sup>1</sup> All Priority Development Projects (PDPs) require a TCBMP.

<sup>&</sup>lt;sup>2</sup> BMPs designed to treat stormwater (e.g. LID and hydromod) shall be considered TCBMPs.

<sup>\*</sup> For location of BMP's, see approved Record Plan dated <u>XX/XX/XX</u> plan <u>TBD</u> sheet <u>TBD</u>

#### Responsible Party for the Construction Phase:

Identify the parties responsible for maintenance during the construction phase of the BMPs identified above and Source Controls specified in Attachment B.

Developer's Name: <u>Jose Luis Islas</u>							
Address: 2348 La Costa Ave. #311							
City Carlsbad	_State CA	Zip <u>92009</u>					
Email Address:	joseluisislas 64@yahoo.com						
Phone Number: <u>760-427-4176</u>							
Engineer of Work: RBF Consul	ting, a Michael Baker Corporation						
Engineer's Phone Number:	(760) 603-6240						

#### Responsible Party for Ongoing Maintenance:

Identify the parties responsible for on-going maintenance of the BMPs identified above and Source Controls specified in Attachment B. Include the appropriate written agreement with the entities responsible for O&M in Attachment F. Please see Chapter 5 "Stormwater Facility Maintenance" of the County SUSMP for appropriate maintenance mechanisms.

Owner's Name: Pacific	za Estates HOA	
Address: <u>TBD</u>		
City Fallbrook	State CA	Zip
Email Address:	TBD	
Phone Number: <u>TBD</u>		_
1	an HOA, provide information	on for principal partner or Agent for for the Board or property manager at

#### Funding Source:

Provide the funding source or sources for long-term operation and maintenance of each BMP identified above. Please see Chapter 5 "Stormwater Facility Maintenance" of the County SUSMP for the appropriate funding source options. By certifying the Major SWMP the applicant is certifying that the funding responsibilities have been addressed and will be transferred to future owners.

The energy dissipaters and bioretention basins shall be located on common area (Lots "B" and "D"). Permeable Pavement is located along the easterly access road. Maintenance costs shall be covered by an HOA or similar shared maintenance agreement between residents. Individual homeowners are responsible for any maintenance cost that may be associated with on-lot vegetated swales.

#### **ATTACHMENTS**

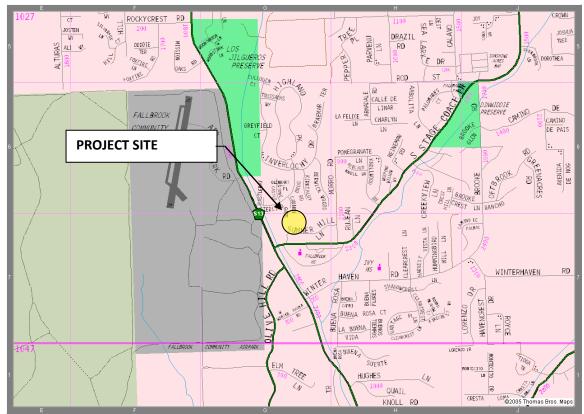
Please include the following attachments.

	ATTACHMENT	COMPLETED	N/A
Α	Project Location Map	✓	
В	Source Control Exhibit	✓	
С	Drainage Management Area (DMA)Exhibit	✓	
D	BMP Sizing Design Calculations (Water		
	Quality and Hydromodification) and	✓	
	TCBMP/IMP Design Details		
Е	Geotechnical Certification Sheet		<b>✓</b>
F	Maintenance Plan	✓	
G	Treatment Control BMP Certification (due	./	
	at project completion)	•	
Н	HMP Study	✓	
I	Geomorphic Assessment		<b>✓</b>
J	HMP Exemption Documentation		✓
K	Addendum		✓

**Note:** Attachments B and C may be combined.

# ATTACHMENT A

**Project Location Map** 

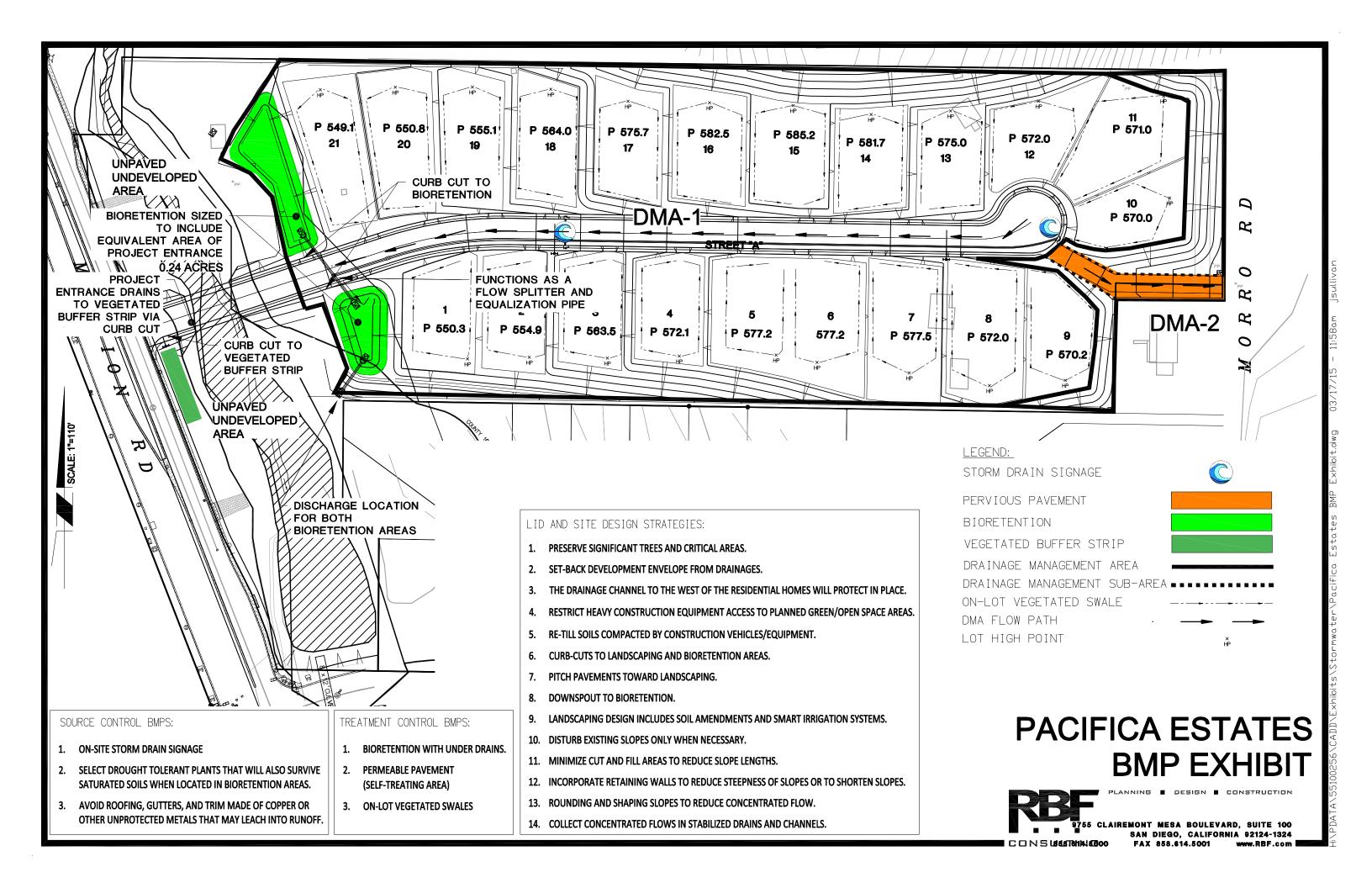


Source: 2005 Thomas Bros. Maps 1027 Section G-7

#### **PACIFICA ESTATES**

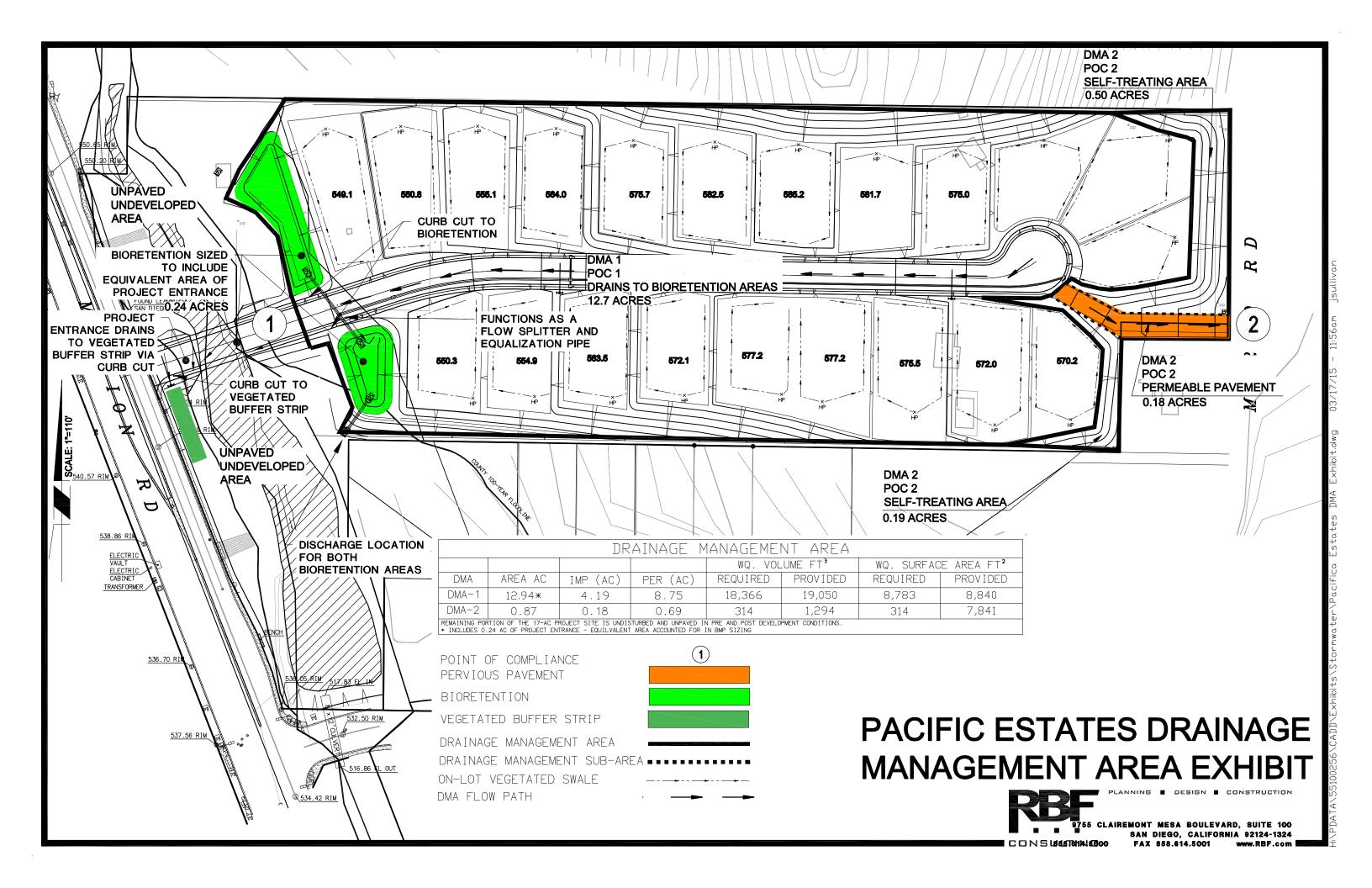
## ATTACHMENT B

### **Source Control and TC-BMP Exhibit**



# ATTACHMENT C

# **Drainage Management Area (DMA) Exhibit**



### **ATTACHMENT D**

# Sizing Design Calculations and TCBMP/LID Design Details

(Provide BMP Sizing Calculator results and/or continuous simulation modeling results, if applicable)

Pacifica Estates
Water Quality Surface Area Requirement
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Volume Base BMPs (Permeable Pavement)

Project Location: San Diego, CA

#### I. Self-treating areas:

DMA Name	Area (square feet)	Area (acres)
DMA-1	N/A	N/A
DMA-2	30,056	0.69

#### II. Self-retaining areas:

DMA Name	Area (square feet)
N/A	

#### III. Areas draining to self-retaining areas:

DMA Name	Post-Project Surface Type	Runoff Factor	Area (square feet)	Receiving Self-Retaining DMA	Receiving Self-Retaining DMA Area (square feet)
N/A					

Pacifica Estates
Water Quality Surface Area Requirement
February 2015
Page 2 of 3

IV. Areas draining to IMPs (repeat for each IMP):

#### **DMA-1: Bioretention**

					Soil Type:	IMP Name		
					D		_	
DMA Name	DMA Area (square feet)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor		Bioretention		
1.1	47,916	Roads	1.0	47,916				
1.2	10,454	Project Entrance	1.0	10,454	Equvilant area included ir	BMP sizing		
1.3	124,146	Lots Impervious	1.0	124,146				
1.4	270.606	Lots Pervious	0.1	37,070	IMP Sizing Factor (WQ		Minimum	Proposed
1.4	370,696	Lots Pervious	0.1	0.1 37,070	Only)	Bioretention	Area	Area*
			Total	219,586	0.04		8,783	8,840

<sup>\*</sup> accounts for side slope area up to the notched weir elevation (0.5' above basin bottom, 2:1 sideslopes) In DMA 1, the provided bioretention area is greater than the minimum area required.

Provided Volume: Bioretention

	Area (ft <sup>2</sup> )	Depth (ft)	Percent Void	Volume (ft <sup>3</sup> )
Surface (bottom area)	8,840	1	100%	8,840
Sub-Surface Soil	8,840	1.5	33%	4,376
Sub-Surface Gravel	8,840	2	33%	5,834
			Total	19,050

	Surface Area REQ.	Surface Area Provided	Volume REQ.	Volume Provided دء
Bioretention Summary	8,783	8,840	18,366	19,050

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Water Quality Surface Area Requirement
February 2015
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IV. Areas draining to IMPs (repeat for each IMP):

#### **DMA 2: Permeable Pavement**

DIVIA 2: Permeable Pavement					Soil Type:	IMP Name	]	
						Permeable	<del>-</del>	
					D	Pavement		
DMA Name	DMA Area (square feet)	Post-Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor				
2.1	7,841	Access Road	1.0	7,841	IMP Sizing Factor (WQ Only)	Permeable Pavement	Minimum Area	Proposed Area (bottom area)
			Total	7,841	0.04		314	7,841

In DMA 2, the provided permeable pavement area is greater than the minimum area required.

Provided Volume: Permeable Pavement

	Area (ft²)	Depth (ft)	Percent Void	Volume (ft³)
Sub-Surface Gravel	7,841	0.5	33%	1,294
			Total	1,294

	Surface Area REQ.	Surface Area Provided	Volume REQ.	Volume Provided
	ft <sup>2</sup>	ft <sup>2</sup>	ft <sup>3</sup>	ft <sup>3</sup>
DMA-2 Permeable Pavement	314	7,841	271	1,294

Pacifica Estates Water Quality Volume Requirement February 2015 Page 1 of 1

#### **Volume Based BMP:**

$$VOL_{WQ} = C * P_{WQ} * A$$

Where

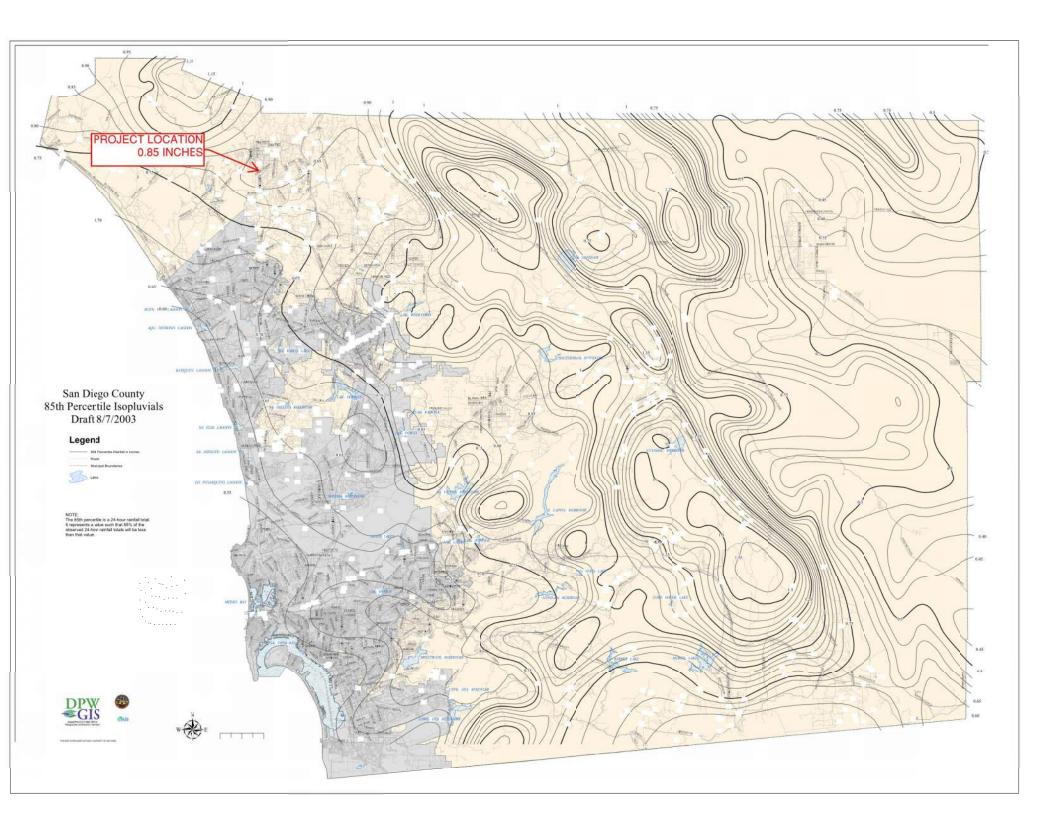
VOL<sub>WQ</sub> = Water Quality Volume Requirement (ac\*in)

C = Node Runoff Coefficient

 $P_{WQ}$  = 0.85 per the County's 85th percentile isopluvial

A = Node Area (ac)

DMA-1	C =	0.46	Per Tabl	le: 3-1, San Diego County Hydrology Manual, June 2003 (2 DU/AC, 'D' Soil)
Bioretention Areas	P <sub>WQ</sub> =	0.85	(in)	
	A =	12.94	(ac)	inlcudes 0.24 ac of project entrance (given topographic constraints, the project entrance does not drain to the
	$VOL_{WQ} =$	5.06	ac-in	bioretention areas, however, the area has still been accounted for in the
	VOL <sub>WQ</sub> =	0.42	ac-ft	BMP design, thus overtreatment is provided)
	$VOL_{WQ} =$	18,366	ft <sup>3</sup>	
DMA-2	C =	0.46	Per Tabl	le: 3-1, San Diego County Hydrology Manual, June 2003 (2 DU/AC, 'D' Soil)
Permeable Pavement	$P_{WQ} =$	0.9	(in)	
	A =	0.18	(ac)	
		0.20	(==)	
	VOL <sub>WQ</sub> =	0.07	ac-in	



#### Pacifica Estates JN 55-100256

Table A-1 Self-Retaining Areas

DMA Name	Area (sf)
On-Lot Vegetated Swale	10,890

Selected BMP	Lot Area	C <sup>(1)</sup>	$I_{WQ}$	$\mathbf{Q}_{WQ}$	$V_{WQ}$
	(AC)		(in/hr)	(cfs)	(ft/s)
Vegetated Swale	0.25	0.46	0.20	0.023	1.00

<sup>(1)</sup> C=0.46, Type 'D' Soils, 2.0 DU/AC

 $Q_{WQ} = C*I_{WQ}*Area$ 

#### Using Manning's Formula for Q<sub>FULL</sub> Capacity of Swale

Proposed Swale Criteria:					<b>∃</b>
Area (A)		0.39	sf		
Wetted Perimeter (WP)		1.57	ft		
Hydraulic Radius (R)		0.25	ft		
Slope (S)		1.0	%		
Bottom Width		1.00	ft		
Total Depth		0.50	ft		
n <sub>WQ</sub>		0.20			
	Q <sub>FULL</sub> =	1.486	(A)	(R) <sup>2/3</sup>	(S) <sup>1/</sup>
	_	$n_{WQ}$	. (A)	(K)	(5)
	$Q_{FULL}=$	0.12 cfs	<u>&gt;</u>	$Q_{WQ} =$	0.02
	$V_{FULL} =$	$Q_{FULL}$	. =	0.30 ft/s	
	_	Α	-	0.30 11/5	

# **ATTACHMENT E**

### **Geotechnical Certification Sheet**

(if applicable)

The design of stormwater treatment and other control measures proposed in this plan requiring
specific soil infiltration characteristics and/or geological conditions has been reviewed and approved
by a registered Civil Engineer, Geotechnical Engineer, or Geologist in the State of California.

Name and registration #	Date

#### ATTACHMENT F

#### **Maintenance Plan**

(Use Chapter 5 of the SUSMP as guidance in developing your Maintenance Plan)

# The following is a general outline to create your project specific Maintenance Plan. A Maintenance Plan is a living document and field conditions may require modifications to the Maintenance Plan.

- I. Inspection, Maintenance Log and Self-Verification Forms (Examples are provided in Appendix F of the San Diego County SUSMP)
- II. Updates, Revisions and Errata
- III. Introduction
  - A. Narrative overview describing the site; drainage areas, routing, and discharge points; and treatment facilities.
- IV. Responsibility for Maintenance
  - A. General
    - (1) Name and contact information for responsible individual(s).
    - (2) Organization chart or charts showing organization of the maintenance function and location within the overall organization.
    - (3) Insert a copy of the recorded maintenance agreement.
    - (4) Maintenance Funding
      - (1) Sources of funds for maintenance
      - (2) Budget category or line item
      - (3) Description of procedure and process for ensuring adequate funding for maintenance
  - B. Staff Training Program
  - C. Records
  - D. Safety
- V. Summary of Drainage Areas and Stormwater Facilities
  - A. Drainage Areas

- (1) Drawings showing pervious and impervious areas (copied or adapted from initial SWMP).
- (2) Designation and description of each drainage area and how flow is routed to the corresponding facility.
- B. Treatment and Flow-Control Facilities
  - (1) Drawings showing location and type of each facility
  - (2) General description of each facility (Consider a table if more than two facilities)
    - (1) Area drained and routing of discharge.
    - (2) Facility type and size

#### VI. Facility Documentation

- A. "As-built" drawings of each facility (design drawings in the draft Plan)
- B. Manufacturer's data, manuals, and maintenance requirements for pumps, mechanical or electrical equipment, and proprietary facilities (include a "placeholder" in the draft plan for information not yet available).
- C. Specific operation and maintenance concerns and troubleshooting

#### VII. Maintenance Schedule or Matrix

- A. Maintenance Schedule for each facility with specific requirements for:
  - (1) Routine inspection and maintenance
  - (2) Annual inspection and maintenance
  - (3) Inspection and maintenance after major storms
- B. Service Agreement Information

Assemble and make copies of your maintenance plan. One copy must be submitted to the County, and at least one copy kept on-site. Here are some suggestions for formatting the maintenance plan:

- Format plans to 8½" x 11" to facilitate duplication, filing, and handling.
- Include the revision date in the footer on each page.
- Scan graphics and incorporate with text into a single electronic file. Keep the electronic file backed-up so that copies of the maintenance plan can be made if the hard copy is lost or damaged.

# PRIVATE TREATMENT CONTROL BMP OPERATION AND MAINTENANCE VERIFICATION FORM BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE BIOFILTERS

BMP Location:				
Responsible Party:				
Phone Number: (	)	Emai	l:	
Responsible Party Add	ress:			
fiscal year (July 1 – June ether maintenance was re required, provide the da E BACK OF TH	ase describe to e 30), and dat equired based ate maintenan IS SHEET ATORS AN	the inspections and te(s) maintenance to on each inspection to was conducted to MAINTENAN	was performed.	tivities that have been conducted du Under "Results of Inspection," indi t type of maintenance. If maintena on of the maintenance. <b>REFER</b> <b>TION DESCRIBING TYPIC</b> <b>ES.</b> If no maintenance was requ
		Results of		
What To Look For?	Date Inspected	Inspection: Work needed? (Yes/No)		intenance Completed and not Maintenance Conducted

What To Look For?	Date Inspected	Results of Inspection: Work needed? (Yes/No)	Date Maintenance Completed and Description of Maintenance Conducted
Accumulation of Sediment, Litter, Grease			
Standing Water			
Erosion			
Overgrown Vegetation			
Poor Vegetation Establishment			
Structural Damage			

- 3. Attach copies of available supporting documents (photographs, copies of maintenance contracts, and/or maintenance records).
- 4. Sign the bottom of the form and return to: County of San Diego Watershed Protection Program

Treatment Control BMP Tracking 5201 Ruffin Road, Suite P, MS 0326

San Diego, CA 92123 OR

Email: Watersheds@sdcounty.ca.gov

# PRIVATE TREATMENT CONTROL BMP OPERATION AND MAINTENANCE VERIFICATION FORM BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE BIOFILTERS-SIDE 2

This guide sheet provides general indicators for maintenance only and for a wide array of treatment control BMPs. Your developer prepared maintenance plans specifically for your treatment control BMP as an appendix to the Stormwater Management Plan. Also, if you have a manufactured structure, please refer to the manufacturer's maintenance instructions.

Biotilters include the following:	D Discrete view Cosility D Discrete Days
<ul><li>☐ Vegetated Filter Strip/Swale</li><li>☐ Manufactered Higher-Flow-Rate Biofilters, such</li></ul>	☐ Bioretention Facility ☐ Planter Boxes
	unobstructed, that erosion is prevented, and that soils are held
together by plant roots and are biologically active. Typ	
	g.
Bioretention BMPs Inspec	tion and Maintenance Checklist
Typical Maintenance Indicators	Typical Maintenance Actions
Accumulation of sediment (over 2 inches deep or	Remove and properly dispose of accumulated materials,
covers vegetation), litter, or debris	without damage to the vegetation. Confirm that soil is not
	clogging and that the area drains after a storm event. Till
	or replace soil as necessary.
Poor vegetation establishment	Ensure vegetation is healthy and dense enough to provide
	filtering and to protect soils from erosion. Replenish mulch as necessary (if less than 3 inches deep), remove fallen
	leaves and debris, prune large shrubs or trees, and mow
	turf areas.
Overgrown vegetation—woody vegetation not part	Mow or trim as appropriate, but not less than the design
of design is present and grass excessively tall	height of the vegetation (typically 4-6 inches for grass).
(greater than 10 inches)	Confirm that irrigation is adequate and not excessive and
	that sprays do not directly enter overflow grates. Replace
	dead plants and remove noxious and invasive weeds.
Erosion due to concentrated irrigation flow	Repair/re-seed eroded areas and adjust the irrigation.
Erosion due to concentrated stormwater runoff flow	Repair/re-seed eroded areas and make appropriate
	corrective measures such as adding erosion control blankets, adding stone at flow entry points, or re-grading
	where necessary.Remove obstructions and sediment
	accumulations so water disperses.
Standing water (BMP not draining) . If mosquito	Where there is an underdrain, such as in planter boxes
larvae are present and persistent, contact the San	and manufactured biofilters, check the underdrain piping
Diego County Vector Control Program at (858) 694-	to make sure it is intact and unobstructed. Abate any
2888. Mosquito larvicides should be applied only	potential vectors by filling holes in the ground in and
when absolutely necessary and then only by a	around the biofilter facility and by insuring that there are
licensed individual or contractor.	no areas where water stands longer than 96 hours
Objective and industrial and according to the control of	following a storm .
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet, or outlet structures	Repair or replace as applicable.
Before the wet season and after rain events: remove	Where cisterns are part of the system
sediment and debris from screens and overflow	which disterns are part of the system
drains and downspouts; ensure pumps are	
functioning, where applicable; check integrity of	

mosquito screens; and; check that covers are

manufacturer's maintenance guidelines

For manufactured high-flow-rate biofilters, see

properly seated and locked.

# PRIVATE TREATMENT CONTROL BMP OPERATION AND MAINTENANCE VERIFICATION FORM BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE BIOFILTERS

BMP Location:				
Responsible Party:				
Phone Number: (	)	Emai	l:	
Responsible Party Add	ress:			
fiscal year (July 1 – June ether maintenance was re required, provide the da E BACK OF TH	ase describe to e 30), and dat equired based ate maintenan IS SHEET ATORS AN	the inspections and te(s) maintenance to on each inspection to was conducted to MAINTENAN	was performed.	tivities that have been conducted du Under "Results of Inspection," indi t type of maintenance. If maintena on of the maintenance. <b>REFER</b> <b>TION DESCRIBING TYPIC</b> <b>ES.</b> If no maintenance was requ
		Results of		
What To Look For?	Date Inspected	Inspection: Work needed? (Yes/No)		intenance Completed and not Maintenance Conducted

What To Look For?	Date Inspected	Results of Inspection: Work needed? (Yes/No)	Date Maintenance Completed and Description of Maintenance Conducted
Accumulation of Sediment, Litter, Grease			
Standing Water			
Erosion			
Overgrown Vegetation			
Poor Vegetation Establishment			
Structural Damage			

- 3. Attach copies of available supporting documents (photographs, copies of maintenance contracts, and/or maintenance records).
- 4. Sign the bottom of the form and return to: County of San Diego Watershed Protection Program

Treatment Control BMP Tracking 5201 Ruffin Road, Suite P, MS 0326

San Diego, CA 92123 OR

Email: Watersheds@sdcounty.ca.gov

# PRIVATE TREATMENT CONTROL BMP OPERATION AND MAINTENANCE VERIFICATION FORM BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE BIOFILTERS-SIDE 2

This guide sheet provides general indicators for maintenance only and for a wide array of treatment control BMPs. Your developer prepared maintenance plans specifically for your treatment control BMP as an appendix to the Stormwater Management Plan. Also, if you have a manufactured structure, please refer to the manufacturer's maintenance instructions.

Biotilters include the following:	D Discrete view Cosility D Discrete Days
<ul><li>☐ Vegetated Filter Strip/Swale</li><li>☐ Manufactered Higher-Flow-Rate Biofilters, such</li></ul>	☐ Bioretention Facility ☐ Planter Boxes
	unobstructed, that erosion is prevented, and that soils are held
together by plant roots and are biologically active. Typ	
	g.
Bioretention BMPs Inspec	tion and Maintenance Checklist
Typical Maintenance Indicators	Typical Maintenance Actions
Accumulation of sediment (over 2 inches deep or	Remove and properly dispose of accumulated materials,
covers vegetation), litter, or debris	without damage to the vegetation. Confirm that soil is not
	clogging and that the area drains after a storm event. Till
	or replace soil as necessary.
Poor vegetation establishment	Ensure vegetation is healthy and dense enough to provide
	filtering and to protect soils from erosion. Replenish mulch as necessary (if less than 3 inches deep), remove fallen
	leaves and debris, prune large shrubs or trees, and mow
	turf areas.
Overgrown vegetation—woody vegetation not part	Mow or trim as appropriate, but not less than the design
of design is present and grass excessively tall	height of the vegetation (typically 4-6 inches for grass).
(greater than 10 inches)	Confirm that irrigation is adequate and not excessive and
	that sprays do not directly enter overflow grates. Replace
	dead plants and remove noxious and invasive weeds.
Erosion due to concentrated irrigation flow	Repair/re-seed eroded areas and adjust the irrigation.
Erosion due to concentrated stormwater runoff flow	Repair/re-seed eroded areas and make appropriate
	corrective measures such as adding erosion control blankets, adding stone at flow entry points, or re-grading
	where necessary.Remove obstructions and sediment
	accumulations so water disperses.
Standing water (BMP not draining) . If mosquito	Where there is an underdrain, such as in planter boxes
larvae are present and persistent, contact the San	and manufactured biofilters, check the underdrain piping
Diego County Vector Control Program at (858) 694-	to make sure it is intact and unobstructed. Abate any
2888. Mosquito larvicides should be applied only	potential vectors by filling holes in the ground in and
when absolutely necessary and then only by a	around the biofilter facility and by insuring that there are
licensed individual or contractor.	no areas where water stands longer than 96 hours
Objective and industrial and according to the control of	following a storm .
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet, or outlet structures	Repair or replace as applicable.
Before the wet season and after rain events: remove	Where cisterns are part of the system
sediment and debris from screens and overflow	which disterns are part of the system
drains and downspouts; ensure pumps are	
functioning, where applicable; check integrity of	

mosquito screens; and; check that covers are

manufacturer's maintenance guidelines

For manufactured high-flow-rate biofilters, see

properly seated and locked.

### ATTACHMENT G

# Treatment Control BMP Certification for DPW Permitted Land Development Projects

After TCBMP construction, complete a TCBMP Certification form to verify with County staff that all constructed TCBMPs on the record plans match the approved TCBMPs in the most current SWMP. TCBMP Certification must be completed and verified for permit closure.



# Treatment Control BMP Certification for DPW Permitted Land Development Projects

Permit Number (e.g. L-gr	ading)	HSU Watershed	
Project Name			
Location / Address	_		
Maintenance Notification	/Agreement No.:		
	Responsible Party	y for Construction Phase	
Developer's Name:			
Address:			
City	State	Zip	
Email Address:			
Phone Number:			
Engineer of Work:			
Engineer's Phone Number	er:		
	Responsible Party	for Ongoing Maintenance	
Owner's Name(s)*			
Address:			
City	State	Zip	
Email Address:			
Phone Number:			

<sup>\*</sup> Note: If a corporation or LLC, provide information for principal partner or Agent for Service of Process. If an HOA, provide information for the Board or property manager at time of project closeout.

Treatment Control BMPs (TCBMPs) <sup>1,2</sup> (List all from SWMP)			
Lot Number Or Location	Description/Type	Sheet	
All Priority Development Pro	ojects (PDPs) require a TCBMP. nwater shall be considered TCBMPs.		

(Add sheet for all additional BMPs)

#### For Applicant to submit to PDCI:

<ul> <li>Copy of the final accepted SWMP and any acception</li> <li>Copy of the most current plan showing the Section sheets of the TCBMPs and the location of Photograph of each TCBMP.</li> <li>Copy of the approved TCBMP maintenance agree</li> </ul>	Stormwater TCBMP Table, plans/cross-f each verified as-built TCBMP.
By signing below, I certify that the treatment control BM constructed and all BMPs are in substantial conformance regulations. I understand the County reserves the right to compliance with the approved plans and Watershed Prot determined that the BMPs were not constructed to plan onecessary before permits can be closed.	e with the approved plans and applicable o inspect the above BMPs to verify ection Ordinance. Should it be
Please sign your name and seal.	[SEAL]
Professional Engineer's Printed Name:	
Professional Engineer's Signed Name:	
Date:	

COUNTY - OFFICIAL USE ONLY:	
For PDCI:	
PDCI Inspector:	<u> </u>
Date Project has/expects to close:	_
Date Certification received from EOW:	
By signing below, PDCI Inspector concurs that every noted TCBMP has be	een installed per plan.
PDCI Inspector's Signature:Dar	te:
FOR WPP:	
Date Received from PDCI:	
WPP Submittal Reviewer:	
WPP Reviewer concurs that the information provided for the following TC enter into the TCBMP Maintenance verification inventory:	BMPs is acceptable to
List acceptable TCBMPs:	
WPP Reviewer's Signature:Dat	e:
Provide a copy of the certification sheet to DPLU.	



# COUNTY OF SAN DIEGO DEPARTMENT OF PUBLIC WORKS POST-CONSTRUCTION TRACKING AND INVENTORY REPORT

General Project Information
Permit NumberSWMP Category (Major/Minor) Location / Address
Location / Address Engineer of Work: State Registration Number:
Company Name:
Address:
Email Address:
Phone Number:
Priority Development Project – Step 1:
Percent Impervious Before Construction: %
Percent Impervious After Construction: %
Project Disturbed Area:Acres
Hydromodification Management − Step 3: Yes □ or No □
Primary or Secondary Pollutants of Concerns – Step 4 (check all that apply)  Sediment Trash and Debris Oxygen Demanding Substances Organic Compounds Oil and Grease Bacteria and Viruses Pesticides
Project Specific Site Design, LID and Source Control BMPs
All selected Site Layout Strategies, LID, and Source Control BMPs must be shown on the Plan.
Site Layout Strategies – Step 5 (check all that apply)  Limitation of Development Envelope  Minimization of imperviousness  Using drainage as a design element  Setbacks from creeks, wetlands, and riparian habitats
Disperse Runoff from Impervious Surfaces to Pervious – Step 5 (check all that apply)  Street and Road Design  Driveway, Sidewalk, Bikepath Design  Landscape Design  Direct Runoff to Treatment BMP(s)

County of San D Department of P Engineer's SWM Page 2 of 2	ublic Works				
Stormdrai Trash Stor Private Ro Dock Are Vehicle W	Vash Areas at Wash Areas	nciling		cape Irrigation Design reways & Guest Parking ys	
	Post-constru	ction Treatment (	Control BMP Inform	ation	
Name Street Number City		et Name	Phone Number ()		
Email Address Project Mainte	enance Category (1	, 2, 3 or 4):			
BMP Identifier*	BMP Type	BMP Pollutant of Concern Efficiency (H,M,L) – Table 11	Final Construction Date (to be completed by County inspector)	Final Construction Inspector Name (to be completed by County inspector)	
* For location	of BMP's, see app	proved Record Plan	ı dated	, plan sheet	

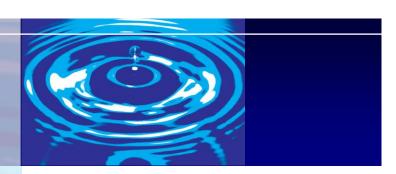
County of San Diego Department of Public Works Engineer's SWMP Final Report Page 2 of 2

Record Plan Certif	<u>ication</u>
I certify that the above items for this project are in subsplans.  Yes or No	tantial conformance with the approved
Please sign your name and seal.	[SEAL]
Print Name:	
Sign Name:	

# **ATTACHMENT H**

# **HMP Study**

(Contact County staff to determine if this should be a separate report from the Major SWMP)



# **Hydromodification Mitigation Study**

Pacifica Estates San Diego, California

June 2014

Prepared for: Jose Luis Islas 514 La Costa Avenue Encinitas, CA 92024

Prepared by:



#### **RBF CONSULTING**

5050 Avenida Encinas, STE 260 Carlsbad, California 92008 760.603.6240 telephone

RBF Contact Person:

Tim Thiele, P.E. 60283

RBF JN 141257

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# **Section 1. Integrated Management Practices**

This report addresses hydromodification mitigation for the proposed development at Pacifica Estates. Please refer to the project specific Drainage Study and Storm Water Management Plan (SWMP), found under separate cover, for additional project site information pertaining to 100-year peak flows and water quality treatment.

#### 1.1. Bioretention

Bioretention basins have been strategically located along the westerly edge of the residential development, both north and south of the drive aisle. The only non-landscaped portion of the project site not draining to the proposed bioretention areas will consist of permeable pavement . As such, all project site runoff is disconnected prior to discharge from the site.

The two proposed bioretention basins will consist of a 24-inch rock section, an 18-inch soil matrix layer, and 12 inches of available surface ponding (100-percent voids). Passive infiltration at a conservative rate of 0.1 inches per hour has been accounted for in the San Diego Hydrology Model (SDHM). The basins will be fitted with perforated subdrains and impermeable side-wall liners will be extended into the sub-grade to prevent the potential for lateral migration of flow.

A 12-inch diameter riser will be set at one foot above the bioretention basin surface.

#### Bioretention Maintenance

#### **Maintenance Program for Bioretention Area**

Inspection Frequency/Indications:	<ul> <li>Regular Inspections</li> <li>□ Before wet season begins (September);</li> <li>□ Every 60 days during wet season (September-April);</li> <li>□ After wet season (April).</li> </ul>
	Performance Inspections ☐ After rainfall events greater than 0.5 inch
<b>Maintenance Indications Connections</b>	<b>Maintenance Activities Connections</b>
☐ Damage to inlet/outlet, sideslopes, headwall, or other structures	Repair inlet/outlet structures, side slopes, fences, or other structural elements as needed to maintain performance of the facility.
<ul> <li>Over-grown vegetation, emergent woody vegetation and/or weeds</li> </ul>	☐ Trim vegetation to average height of 12 inches and remove trimmings.
	Remove emergent trees and other vegetation that are not part of bioretention basin plan and weeds
	☐ Re-seed and re-plan barren areas prior to rainy season
	☐ Install erosion blanket on barrent spots if revegetation is not successful
☐ Sediment accumulation over 3 inches	☐ Remove sediment accumulation at or near plant height
☐ Trash, debris, and vegetative litter	☐ Remove trash, debris, and vegetative litter
☐ Rodents or other vectors	<ul> <li>Abate and control rodents as necessary to maintain performance of the facility</li> <li>Drain standing water</li> </ul>
Waste Disposal	Sediment, other pollutants, and all other waste shall be properly disposed of in a licensed landfill or by another appropriate disposal method in accordance with local, state, and federal regulations.

#### 1.2. Permeable Pavement

The easterly drive aisle (access road) will not drain to the proposed bioretention due to the topography of the site. This access road will be constructed of permeable pavement, and is considered a self-treating area for water quality purposes. Project site area draining easterly consists of landscaped slopes and the access road, which will be constructed with permeable pavement. As such, all project site area draining easterly under proposed conditions is considered self-treating.

The permeable pavement section will consist of a 6-inch rock section and the permeable pavers themselves. The permeable pavement is not required for hydromodification mitigation, and thus has not been included in the SDHM analysis.

#### 1.2.1 Permeable Pavement Maintenance

#### **Maintenance Program for Permeable Pavement**

Inspection Frequency/Indications:	<ul> <li>Regular Inspections</li> <li>□ Before wet season begins (September);</li> <li>□ After wet season (April).</li> <li>Performance Inspections</li> <li>□ After rainfall events greater than 0.5 inches, or any rainfall that fills the basin.</li> </ul>
Activity	Schedule
☐ Keep landscaped areas well maintained	☐ Ongoing
Prevent soil from being washed onto pavement	
☐ Vacuum clean surface using commercially available sweeping machines	☐ 2 – 3 times per year, preferably before and after rainy season, and once mid-summer.
☐ Pressure wash or power blow surface to restore	☐ Annually
porosity.	·
<ul> <li>☐ If routine cleaning does not restore infiltration rates, then reconstruction of part of the whole of a pervious surface may be required.</li> <li>☐ The surface area affected by hydraulic failure should be lifted for inspection of the internal materials to identify the location and extent of the blockage.</li> <li>☐ Surface materials should be lifted and replaced after brush cleaning. Geotextiles may need complete replacement.</li> <li>☐ Sub-surface layers may need cleaning and replacing.</li> </ul>	☐ As needed (max every 15 – 20 years).
Removed silts may need to be disposed of as controlled waste.	
Waste Disposal	Sediment, other pollutants, and all other waste shall be properly disposed of in a licensed landfill or by another appropriate disposal method in accordance with local, state, and federal regulations.

## **Section 2.** Hydromodification Study Methods

To determine the impact of hydromodification and to provide a design that fully mitigates potential hydromodification impacts, calculations were performed using the Hydrologic Simulation Program Fortran (HSPF) within the San Diego Hydrology Model (SDHM). HSPF has been the state-of-the-art program for long-term continuous simulation calculations since its inception over 30 years ago.

The model uses hourly rainfall data collected at the Fallbrook rain gage. The loss rates applied to the precipitation data are provided in Appendix F of the Final Hydromodification Management Plan for the County of San Diego.

#### 2.1. Typical Case

Two Points of Compliance have been modeled within SDHM, based on the project site discharging to the west and east under pre and post development conditions. The project site area draining easterly is reduced under proposed conditions, as compared to existing conditions. This reduction in area is enough to "pass" hydromodification without the need for IMPs, despite a slight increase in impervious area (access road).

#### 2.2. Modeling Approach

The northerly and southerly bioretention areas have each been modeled within SDHM. The proposed storm drain system will be installed such that all runoff from the residential pads and street is discharged evenly between the two bioretention areas. As such, the amount of impervious and pervious area draining to each bioretention basin is the same.

As mentioned above in Section 1.2, the area draining easterly does not require IMPs to mitigate hydromodification impacts. As such, the proposed permeable pavement along the easterly drive aisle is not included in the SDHM analysis.

#### **Section 3.** Conclusions

The site is currently steep agriculture land. To mitigate potential hydromodification impacts from development, two bioretention areas and level grading have been proposed. They collectively serve a number of important purposes:

- The bioretention areas provide runoff storage and attenuation of peak flow discharge rates and flow duration to pre-project levels.
- The use of select import in IMPs will provide increased infiltration rate and flow retention, which will result in increased initial abstraction (the minimum precipitation required to cause runoff).
- The bioretention areas provide a means to disconnect impervious area runoff prior to discharge from the project site. In that regard, they serve as a Low Impact Development (LID) IMP.
- The soil filtration and biological uptake of the plant life within the bioretention areas will provide water quality treatment from the pollutants typically associated with residential rooftop runoff and roadways, respectively.

Table 3-1 presents the hydrologic soil type, land cover/use and slope for areas that drain to each point of compliance. The pre- and post-project areas analyzed for this study are equal and total 13.39 acres. The remaining portion of the 17-acre site is not developed or disturbed (Lots "A" and "C").

Table 3-2 provides a summary of the volume and area necessary to meet hydromodification and water quality requirements. The "proposed plan" volume and area represent the maximum of volume and area, respectively, necessary to provide both hydromodification mitigation and water quality treatment.

Table 3-3 shows that the mitigated post-development 2-, 5-, 10-, and 25-year peak runoff rates are less than or equal to the predevelopment runoff rates at each of the two POC's. Each point of compliance mitigates hydromodification at the project boundary.

Complete results of the SDHM analysis are included in Attachment A, and clearly show that mitigation of both peak flow and flow duration are accomplished for the statistical range of events between 10% of Q2 and Q10 (hydromodification zone). This result is in compliance with the latest standards of the County of San Diego SUSMP.

Table 3-1 Summary of Pre- and Post-Project SDHM Land Characteristics

Hydrologic Soil Type	Cover	Slope	POC #1 (acres)	POC #2 (acres)
		<b>Existing Condition</b>		
D	Grass	Steep (10-20%)	10.00	3.39
		<b>Proposed Condition</b>		
D	Grass	Flat (0-5%)	8.13	-
D D	Grass Impervious	Flat (0-5%) Flat (0-5%)	8.13 3.15	- -
-		` ′		- - -
D	Impervious	Flat (0-5%)	3.15	-

**Table 3-2: Hydromodification Mitigation Requirements** 

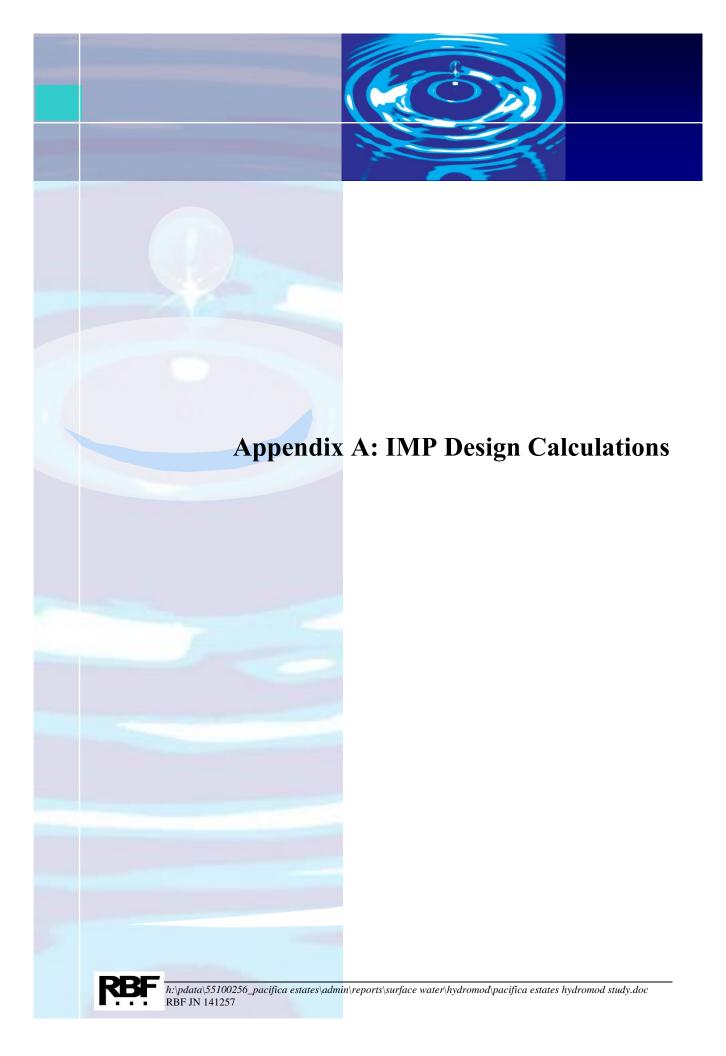
Post		Hydromodification Mitigation Requirements		Water Quality Treatment Requirements		Proposed Plan		
P.O.C.	Development Drainage Area	$HM_V$	$\mathrm{HM}_{\mathrm{SF}}$	WQv	WQ <sub>SF</sub>	Bioretention Storage Volume	Bioretention Surface Area	Permeable Pavement Surface Area
	(ac)	(ac-ft)	(ac)	(ac-ft)	(SF)	(ac-ft)	(SF)	(SF)
1	12.38	0.44	8,336	0.43	8,354	0.44	8,840	-
2	1.01	-	-	0.01	261	-	-	6,534

Table 3-3: Pre- and Mitigated Post-Development 2-, 5-, 10-, and 25-Year Peak Flows

	2-Year		5-Year		10-Year		25-Year	
P.O.C.	Pre- Project	Mitigated Post- Project	Pre- Project	Mitigated Post- Project	Pre- Project	Mitigated Post- Project	Pre- Project	Mitigated Post- Project
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
1	3.35	1.89	5.55	3.16	6.44	3.40	7.72	3.69
2	1.14	0.44	1.88	0.61	2.18	0.71	2.62	0.86

# **Section 4.** References

**Brown and Caldwell, 2011.** Brown and Caldwell. (March 2011). Final Hydromodification Management Plan, prepared for the County of San Diego



# SDHM PROJECT REPORT

## General Model Information

Project Name: Pacifica Estates
Site Name: Pacifica Estates

Site Address:

City:

Report Date: 5/29/2014
Gage: FALLBROO
Data Start: 10/01/1959
Data End: 09/30/2004

Timestep: Hourly Precip Scale: 1.00

Version: 2014/04/24

#### **POC Thresholds**

Low Flow Threshold for POC1: 10 Percent of the 2 Year

High Flow Threshold for POC1: 10 Year

Low Flow Threshold for POC2; \ \ 10 Percent of the 2 Year

High Flow Threshold for POC2: 10 Year

# Landuse Basin Data Predeveloped Land Use

#### **EX West**

Bypass: No

GroundWater: No

Pervious Land Use Acres D,Grass,STEEP(10-20 10

Pervious Total 10

Impervious Land Use Acres

Impervious Total 0

Basin Total 10

Element Flows To:

Surface Interflow Groundwater

**EX East** 

Bypass: No

GroundWater: No

Pervious Land Use Acres D,Grass,STEEP(10-20 3.39

Pervious Total 3.39

Impervious Land Use Acres

Impervious Total 0

Basin Total 3.39

Element Flows To:

Surface Interflow Groundwater



#### Mitigated Land Use

#### Northerly Half Road and Lots

Bypass: Yes

GroundWater: No

Pervious Land Use Acres D,Grass,FLAT(0-5%) 4.065

Pervious Total 4.065

Impervious Land Use Acres IMPERVIOUS-FLAT 1.575 IMPERVIOUS-MOD 0.55

Impervious Total 2.125

Basin Total 6.19

Element Flows To:

Surface Interflow Groundwater

Surface tention Area Surface tention Area

**Access Road** 

Bypass: No

GroundWater: No

Pervious Land Use Acres D,Grass,STEEP(10-20 0.86

Pervious Total 0.86

Impervious Land Use Acres IMPERVIOUS-MOD 0.15

Impervious Total 0.15

Basin Total 1.01

Element Flows To:

Surface Interflow Groundwater



Southerly Half Road and Lots

Bypass: Yes

GroundWater: No

Pervious Land Use Acres D,Grass,FLAT(0-5%) 4.065

Pervious Total 4.065

Impervious Land Use Acres IMPERVIOUS-FLAT 1.575 IMPERVIOUS-MOD 0.55

Impervious Total 2.125

Basin Total 6.19

Element Flows To:

Surface Interflow Groundwater Surface tention Area Surface tention Area

# Routing Elements Predeveloped Routing



#### Mitigated Routing

#### South Bioretention Area

Bottom Length: 44.00 ft. Bottom Width: 44.00 ft. Material thickness of first layer: 1.5

Material type for first layer: Amended 5 in/hr

0.1

33.439

106.213

139.652

23.94

0.5

1

18

26.492

18.97

139.652

Material thickness of second layer: 2

Material type for second layer: GRAVEL

Material thickness of third layer:

Material type for third layer: GRAVEL

Infiltration On
Infiltration rate:
Infiltration safety factor:
Total Volume Infiltrated (ac-ft):
Total Volume Through Riser (ac-ft):
Total Volume Through Facility (ac-ft):

Percent Infiltrated:

Underdrain used
Underdrain Diameter (ft):
Orifice Diameter (in):
Offset (in):
Flow Through Underdrain (ac-ft):

Total Outflow (ac-ft):
Percent Through Underdrain:

Discharge Structure

Riser Height: 1 ft. Riser Diameter: 12 in.

Notch Type: Rectangular
Notch Width: 0.250 ft.
Notch Height: 0.500 ft.

Element Flows To:

Outlet 1 Outlet 2

#### Landscape Swale Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	
0.0000	0.0772	0.0000	0.0000	0.0000
0.0604	0.0766	0.0011	0.0000	0.0000
0.1209	0.0760	0.0023	0.0000	0.0000
0.1813	0.0754	0.0034	0.0045	0.0045
0.2418	0.0747	0.0046	0.0045	0.0045
0.3022	0.0741	0.0058	0.0045	0.0045
0.3626	0.0735	0.0070	0.0045	0.0045
0.4231	0.0728	0.0082	0.0045	0.0045
0.4835	0.0722	0.0094	0.0045	0.0045
0.5440	0.0716	0.0107	0.0045	0.0045
0.6044	0.0710	0.0119	0.0045	0.0045
0.6648	0.0704	0.0132	0.0045	0.0045
0.7253	0.0698	0.0145	0.0045	0.0045
0.7857	0.0691	0.0157	0.0045	0.0045
0.8462	0.0685	0.0170	0.0045	0.0045
0.9066	0.0679	0.0184	0.0045	0.0045
0.9670	0.0673	0.0197	0.0045	0.0045
1.0275	0.0667	0.0210	0.0045	0.0045
1.0879	0.0661	0.0224	0.0045	0.0045

1.1484	0.0655	0.0238	0.0045	0.0045
1.2088	0.0649	0.0251	0.0045	0.0045
1.2692	0.0644	0.0265	0.0045	0.0045
1.3297	0.0638	0.0279	0.0045	0.0045
1.3901	0.0632	0.0294	0.0045	0.0045
1.4505	0.0626	0.0308	0.0045	0.0045
1.5110	0.0620	0.0322	0.0045	0.0045
1.5714	0.0614	0.0337	0.0045	0.0045
1.6319	0.0609	0.0352	0.0045	0.0045
1.6923	0.0603	0.0366	0.0045	0.0045
1.7527	0.0597	0.0381	0.0045	0.0045
1.8132	0.0592	0.0396	0.0045	0.0045
1.8736	0.0586	0.0411	0.0045	0.0045
1.9341 1.9945	0.0580 0.0575	0.0427 0.0442	0.0045 0.0045	0.0045 0.0045
2.0549	0.0569	0.0442	0.0045	0.0045
2.1154	0.0564	0.0438	0.0045	0.0045
2.1758	0.0558	0.0474	0.0045	0.0045
2.2363	0.0553	0.0506	0.0045	0.0045
2.2967	0.0547	0.0522	0.0045	0.0045
2.3571	0.0542	0.0538	0.0045	0.0045
2.4176	0.0537	0.0555	0.0045	0.0045
2.4780	0.0531	0.0571	0.0045	0.0045
2.5385	0.0526	0.0588	0.0045	0.0045
2.5989	0.0521	0.0605	0.0045	0.0045
2.6593	0.0515	0.0622	0.0045	0.0045
2.7198	0.0510	0.0640	0.0045	0.0045
2.7802	0.0505	0.0657	0.0045	0.0045
2.8407	0.0500	0.0675	0.0045	0.0045
2.9011	0.0495	0.0692	0.0045	0.0045
2.9615	0.0489	0.0710	0.0045	0.0045
3.0220	0.0484	0.0728	0.0045	0.0045
3.0824	0.0479	0.0746	0.0045	0.0045
3.1429	0.0474	0.0765	0.0045	0.0045
3.2033	0.0469 0.0464	0.0783	0.0045 0.0045	0.0045 0.0045
3.2637 3.3242	0.0459	0.0802 0.0821	0.0045	0.0045
3.3846	0.0459 0.0454	0.0840	0.0045	0.0045
3.4451	0.0434	0.0859	0.0045	0.0045
3.5000	0.0449	0.0876	0.0045	0.0045
0.0000	Landscano Swalo H		0.0070	0.0043

Landscape Swale Hydraulic Table

## Stage(ft)Area(ac)Volume(ac-ft)Discharge(cfs)To Amended()cfs)Infilt(cfs)

	-/(	,	(3.5 1.7 1.5 1.1 3.1 3.1	,	
3.5000	0.0772	0.0876	0.0000	0.2386	0.0000
3.5604	0.0779	0.0923	0.0000	0.2386	0.0000
3.6209	0.0785	0.0971	0.0000	0.2479	0.0000
3.6813	0.0792	0.1018	0.0000	0.2571	0.0000
3.7418	0.0798	0.1066	0.0000	0.2663	0.0000
3.8022	0.0805	0.1115	0.0000	0.2756	0.0000
3.8626	0.0811	0.1164	0.0000	0.2848	0.0000
3.9231	0.0818	0.1213	0.0000	0.2941	0.0000
3.9835	0.0825	0.1262	0.0000	0.3033	0.0000
4.0440	0.0831	0.1312	0.0000	0.3125	0.0000
4.1044	0.0838	0.1363	0.0000	0.3218	0.0000
4.1648	0.0845	0.1414	0.0000	0.3310	0.0000
4.2253	0.0851	0.1465	0.0000	0.3403	0.0000
4.2857	0.0858	0.1517	0.0000	0.3495	0.0000
4.3462	0.0865	0.1569	0.0000	0.3588	0.0000

4.4066	0.0872	0.1621	0.0000	0.3680	0.0000
4.4670	0.0879	0.1674	0.0000	0.3772	0.0000
4.5275	0.0886	0.1727	0.0000	0.3865	0.0000
4.5879	0.0892	0.1781	0.0000	0.3957	0.0000
4.6484	0.0899	0.1835	0.0000	0.4050	0.0000
4.7088	0.0906	0.1890	0.0000	0.4142	0.0000
4.7692	0.0913	0.1945	0.0000	0.4234	0.0000
4.8297	0.0920	0.2000	0.0000	0.4327	0.0000
4.8901	0.0927	0.2056	0.0000	0.4419	0.0000
4.9505	0.0935	0.2112	0.0000	0.4512	0.0000
5.0110	0.0942	0.2169	0.0000	0.4604	0.0000
5.0714	0.0949	0.2226	0.0000	0.4697	0.0000
5.1319	0.0956	0.2284	0.0000	0.4789	0.0000
5.1923	0.0963	0.2342	0.0000	0.4881	0.0000
5.2527	0.0970	0.2400	0.0000	0.4974	0.0000
5.3132	0.0977	0.2459	0.0000	0.5066	0.0000
5.3736	0.0985	0.2518	0.0000	0.5159	0.0000
5.4341	0.0992	0.2578	0.0000	0.5251	0.0000
5.4945	0.0999	0.2638	0.0000	0.5344	0.0000
5.5000	0.1000	0.2644	0.0000	0.5352	0.0000



#### Surface tention Area

Element Flows To: Outlet 1

Outlet 2

South Bioretention Area



North Bioretention Area

Bottom Length: 80.00 ft. Bottom Width: 80.00 ft. Material thickness of first layer: 1.5

Material type for first layer: Amended 5 in/hr

0.1

0.5

16.451

11.72

140.378

1 18

Material thickness of second layer:

**GRAVEL** Material type for second layer:

Material thickness of third layer: 0

Material type for third layer: **GRAVEL** 

Infiltration On Infiltration rate: Infiltration safety factor:

1 Total Volume Infiltrated (ac-ft): 75.157 Total Volume Through Riser (ac-ft): 65.221 Total Volume Through Facility (ac-ft): 140.378 Percent Infiltrated: 53.54

Underdrain used

Underdrain Diameter (ft): Orifice Diameter (in): Offset (in): Flow Through Underdrain (ac-ft):

Total Outflow (ac-ft): Percent Through Underdrain:

Discharge Structure

Riser Height: 1 ft. Riser Diameter: 12 in( Notch Type: Rectangular Notch Width: 0.250 ft. Notch Height: 0.500 ft.

Element Flows To:

Outlet 2 Outlet 1

#### Landscape Swale Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	
0.0000	0.2028	0.0000	0.0000	0.0000
0.0604	0.2019	0.0037	0.0000	0.0000
0.1209	0.2009	0.0075	0.0000	0.0000
0.1813	0.1998	0.0113	0.0148	0.0148
0.2418	0.1988	0.0151	0.0148	0.0148
0.3022	0.1978	0.0189	0.0148	0.0148
0.3626	0.1967	0.0228	0.0148	0.0148
0.4231	0.1957	0.0267	0.0148	0.0148
0.4835	0.1947	0.0306	0.0148	0.0148
0.5440	0.1937	0.0345	0.0148	0.0148
0.6044	0.1926	0.0384	0.0148	0.0148
0.6648	0.1916	0.0424	0.0148	0.0148
0.7253	0.1906	0.0464	0.0148	0.0148
0.7857	0.1896	0.0504	0.0148	0.0148
0.8462	0.1886	0.0545	0.0148	0.0148
0.9066	0.1876	0.0585	0.0148	0.0148
0.9670	0.1866	0.0626	0.0148	0.0148
1.0275	0.1856	0.0667	0.0148	0.0148
1.0879	0.1846	0.0709	0.0148	0.0148
1.1484	0.1836	0.0750	0.0148	0.0148
1.2088	0.1826	0.0792	0.0148	0.0148

2.5385       0.1615       0.1764       0.0148       0.014         2.5989       0.1605       0.1811       0.0148       0.014         2.6593       0.1596       0.1858       0.0148       0.014         2.7198       0.1587       0.1906       0.0148       0.014         2.7802       0.1578       0.1953       0.0148       0.014         2.8407       0.1569       0.2001       0.0148       0.014         2.9011       0.1559       0.2049       0.0148       0.014         2.9615       0.1550       0.2098       0.0148       0.014         3.0220       0.1541       0.2146       0.0148       0.014         3.0824       0.1532       0.2195       0.0148       0.014         3.1429       0.1523       0.2245       0.0148       0.014         3.2033       0.1514       0.2294       0.0148       0.014         3.3242       0.1496       0.2394       0.0148       0.014         3.3846       0.1487       0.2444       0.0148       0.014         3.4451       0.1478       0.2495       0.0148       0.014	2.5989 2.6593 2.7198 2.7802 2.8407 2.9011 2.9615 3.0220 3.0824 3.1429 3.2033 3.2637 3.3242 3.3846 3.4451	0.1605 0.1596 0.1587 0.1578 0.1569 0.1559 0.1550 0.1541 0.1532 0.1523 0.1514 0.1505 0.1496 0.1487 0.1478 0.1469	0.1811 0.1858 0.1906 0.1953 0.2001 0.2049 0.2098 0.2146 0.2195 0.2245 0.2294 0.2344 0.2394 0.2394 0.2444 0.2495 0.2541	0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148	0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148 0.0148
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Stage(ft)Area(ac)Volume(ac-ft)Discharge(cfs)To Amended()cfs)Infilt(cfs)

· · · · · · · · · · · · · · ·	.,	,	(5.5 .5)=.55595(	,	•••(,•••)•••
3.5000	0.2028	0.2541	0.0000	0.7888	0.0000
3.5604	0.2039	0.2664	0.0000	0.7888	0.0000
3.6209	0.2049	0.2787	0.0000	0.8193	0.0000
3.6813	0.2060	0.2911	0.0000	0.8499	0.0000
3.7418	0.2070	0.3036	0.0000	0.8804	0.0000
3.8022	0.2081	0.3162	0.0000	0.9110	0.0000
3.8626	0.2092	0.3288	0.0000	0.9415	0.0000
3.9231	0.2102	0.3415	0.0000	0.9721	0.0000
3.9835	0.2113	0.3542	0.0000	1.0027	0.0000
4.0440	0.2123	0.3670	0.0000	1.0332	0.0000
4.1044	0.2134	0.3799	0.0000	1.0638	0.0000
4.1648	0.2145	0.3928	0.0000	1.0943	0.0000
4.2253	0.2156	0.4058	0.0000	1.1249	0.0000
4.2857	0.2166	0.4188	0.0000	1.1554	0.0000
4.3462	0.2177	0.4320	0.0000	1.1860	0.0000
4.4066	0.2188	0.4452	0.0000	1.2165	0.0000
4.4670	0.2199	0.4584	0.0000	1.2471	0.0000

4.5275	0.2210	0.4717	0.0000	1.2776	0.0000
4.5879	0.2221	0.4851	0.0000	1.3082	0.0000
4.6484	0.2232	0.4986	0.0000	1.3387	0.0000
4.7088	0.2243	0.5121	0.0000	1.3693	0.0000
4.7692	0.2253	0.5257	0.0000	1.3998	0.0000
4.8297	0.2265	0.5393	0.0000	1.4304	0.0000
4.8901	0.2276	0.5531	0.0000	1.4609	0.0000
4.9505	0.2287	0.5669	0.0000	1.4915	0.0000
5.0110	0.2298	0.5807	0.0000	1.5220	0.0000
5.0714	0.2309	0.5946	0.0000	1.5526	0.0000
5.1319	0.2320	0.6086	0.0000	1.5831	0.0000
5.1923	0.2331	0.6227	0.0000	1.6137	0.0000
5.2527	0.2342	0.6368	0.0000	1.6442	0.0000
5.3132	0.2354	0.6510	0.0000	1.6748	0.0000
5.3736	0.2365	0.6652	0.0000	1.7053	0.0000
5.4341	0.2376	0.6796	0.0000	1.7359	0.0000
5.4945	0.2387	0.6940	0.0000	1.7664	0.0000
5.5000	0.2388	0.6953	0.0000	1.7692	0.0000



#### Surface tention Area

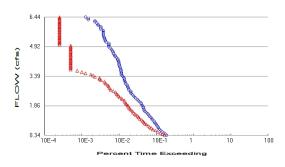
Element Flows To: Outlet 1

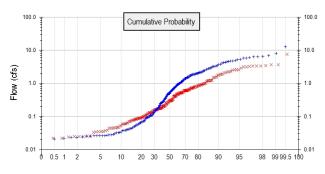
Outlet 2

North Bioretention Area



# Analysis Results POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 10 Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 8.13
Total Impervious Area: 4.25

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period 2 year 3.350492 5 year 5.554619 6.442857 7.723491

Flow Frequency Return Periods for Mitigated. POC #1

 Return Period
 Flow(cfs)

 2 year
 1.885651

 5 year
 3.158942

 10 year
 3.395838

 25 year
 3.691697

## **Duration Flows**

# The Facility PASSED

Flow(cfs) 0.3350 0.3967 0.4584 0.5201 0.5818 0.6435 0.7052 0.7669 0.8286 0.8903 0.9520 1.0137 1.0754 1.1371 1.1988 1.2605 1.3222 1.3839 1.4456 1.5073 1.5689 1.6923 1.7540 1.8157 1.8774 1.9391 2.0008 2.1242 2.1859 2.2476 2.3093 2.3710 2.4327 2.4944 2.5561 2.6178 2.6795 2.7412 2.8029 2.8645 2.9262 2.9879 3.0496 3.1113 3.1730 3.2347 3.2964 3.34108	Predev 741 628 5730 649 449 449 449 459 469 469 479 479 479 479 479 479 479 479 479 47	Mit 672 582 506 432 377 319 289 261 240 213 194 182 171 161 143 125 1106 92 84 80 750 69 62 61 58 55 49 47 41 38 36 34 22 21 20 18 7 16 13 12 12 9 8 17 16 13 12 12 9 8 17 16 13 12 12 9 8 17 16 13 12 12 9 8 17 16 13 12 12 9 8 17 16 13 12 12 9 8 17 16 13 12 12 9 8 17 16 13 12 12 12 12 12 12 12 12 12 12 12 12 12	Percentage 90 85 80 75 71 65 62 59 57 54 52 50 49 51 47 46 44 44 44 46 44 41 39 40 38 39 41 41 39 42 39 38 39 40 39 38 39 41 41 39 42 39 38 39 41 41 39 42 39 38 39 41 41 39 42 39 38 39 40 39 34 32 31 31 30 30 29 28 27 23 21 22 17	Pass/Fail Pass Pass Pass Pass Pass Pass Pass Pas
			17 16 15 10	

3.6049 3.6666 3.7283 3.7900 3.8517 3.9134 3.9751 4.0368 4.0984 4.1601 4.2218 4.2835 4.3452 4.4069 4.4686 4.5303 4.5920 4.6537 4.7771 4.8388 4.9005 4.9622 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.0239 5.	46 45 44 44 40 40 33 33 33 33 31 31 31 31 31 31 31 31 31	4 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	86444445555555666677778889944555566666666777799111166	Pass Pass Pass Pass Pass Pass Pass Pass
6.3812	6	1	16	Pass
6.4429	5	1	20	Pass

# Water Quality

#### **Drawdown Time Results**

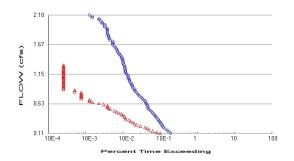
Pond: Surface tention Area

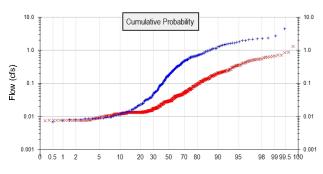
Days	Stage(feet)	Percent of Total Run Time
1	N/A `	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A

Maximum Stage: 1.465 Drawdown Time: Less than 1 day



#### POC 2





+ Predeveloped >

x Mitigated

Predeveloped Landuse Totals for POC #2

Total Pervious Area: 3.39
Total Impervious Area: 0

Mitigated Landuse Totals for POC #2

Total Pervious Area: 0.86 Total Impervious Area: 0.15

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #2

 Return Period
 Flow(cfs)

 2 year
 1.135817

 5 year
 1.883016

 10 year
 2.184128

 25 year
 2.618263

Flow Frequency Return Periods for Mitigated. POC #2

 Return Period
 Flow(cfs)

 2 year
 0.436489

 5 year
 0.613257

 10 year
 0.707745

 25 year
 0.863982

#### **Duration Flows**

## The Facility PASSED

Flow(cfs) 0.1136 0.1345 0.1554 0.1763 0.1972 0.2182 0.2391 0.2600 0.2809 0.3018 0.3227 0.3436 0.3646 0.3855 0.4064 0.4273 0.4482 0.4691 0.4900 0.5110 0.5319 0.5528 0.5737 0.5946 0.6155 0.6364 0.6574 0.6783 0.6992 0.7201 0.7410 0.7619 0.7828 0.8038 0.8247 0.8456 0.8665 0.8874 0.9083 0.9293 0.9502 0.9711 0.9920 1.0129 1.0338 1.0547 1.0757 1.0966	Predev 742 681 628 574 530 485 439 439 373 364 439 386 286 287 189 185 176 170 155 141 132 105 98 84 82 72 69 68 65 55	Mit 392 316 249 199 179 156 116 92 80 74 44 9 36 127 218 15 5 5 3 3 3 3 3 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1	Percentage 52 46 39 34 33 32 25 20 19 18 17 16 13 14 14 13 13 12 11 10 9 8 8 8 6 5 3 3 2 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Pass/Fail Pass
1.0338	59	1	1	Pass
1.0547	59	1	1	Pass
1.0757	56	1	1	Pass

1.2221 1.2430 1.2639 1.2848 1.3057 1.3266 1.3475 1.3685 1.3894 1.4103 1.4312 1.4521 1.4730 1.4939 1.5149 1.5358 1.5567 1.5776 1.5985 1.6403 1.6613	46 45 44 42 41 40 40 39 37 37 34 32 31 29 28 27 26 25 23	1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	2 2 2 2 2 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Pass Pass Pass Pass Pass Pass Pass Pass
1.4939 1.5149 1.5358 1.5567 1.5776 1.5985 1.6194 1.6403	32 31 29 28 27 26 25	0 0 0 0 0 0	0 0 0 0 0 0	Pass Pass Pass Pass Pass Pass Pass Pass
1.7449 1.7658 1.7868 1.8077 1.8286 1.8495 1.8704 1.8913 1.9122 1.9332 1.9541 1.9750	18 17 16 16 15 15 15 15		0 0 0 0 0 0 0 0 0	Pass Pass Pass Pass Pass Pass Pass Pass
1.9959 2.0168 2.0377 2.0586 2.0796 2.1005 2.1214 2.1423 2.1632 2.1841	13 13 11 10 9 9 6 6 5	0 0 0 0 0 0 0	0 0 0 0 0 0 0	Pass Pass Pass Pass Pass Pass Pass Pass

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## Water Quality

#### **Drawdown Time Results**

Pond: Surface tention Area

Days	Stage(feet)	Percent of Total Run Time
1	N/A `	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	N/A	N/A

Maximum Stage: 1.465 Drawdown Time: Less than 1 day



#### Model Default Modifications

Total of 0 changes have been made.

#### **PERLND Changes**

No PERLND changes have been made.

#### **IMPLND Changes**

No IMPLND changes have been made.



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# Appendix Predeveloped Schematic

	EX W 10.00	// 2	EX Ea 3.39a	ast c		

## Mitigated Schematic

<b>#</b>	North Half F	<b>#</b>	South Half F	erly Coad <sup>2</sup>	Acces Road	SS	
	and L 6.19a	ots	and L	ots	1.01a	С	
<b>58</b>	North Bioret	entid	South Bioret	ı tentioi			
	Area		Area				

#### Predeveloped UCI File

RUN

```
GLOBAL
 WWHM4 model simulation
                             END
       1959 10 01
                                  2004 09 30
 START
 RUN INTERP OUTPUT LEVEL
                             0
 RESUME
            0 RUN
                  1
                                        UNIT SYSTEM
END GLOBAL
FILES
<File> <Un#>
               <---->***
<-ID->
WDM
          26
               Pacifica Estates.wdm
MESSU
          25
               PrePacifica Estates.MES
          27
               PrePacifica Estates.L61
          28
               PrePacifica Estates.L62
          30
               POCPacifica Estates1.dat
               POCPacifica Estates2.dat
          31
END FILES
OPN SEQUENCE
                     INDELT 00:60
   INGRP
                30
     PERLND
     COPY
                501
     COPY
                502
     DISPLY
                  1
     DISPLY
                  2
   END INGRP
END OPN SEQUENCE
DISPLY
 DISPLY-INFO1
   # - #<----Title
                                   >***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND
           EX West
                                      MAX
                                                                 2
                                                                     30 9
   1
                                                            1
                                                            1
                                                                     31
   2
            EX East
                                      MAX
 END DISPLY-INFO1
END DISPLY
COPY
 TIMESERIES
               NMN ***
   # - # NPT
             1
                 1
 501
             1
                  1
 502
             1
                  1
 END TIMESERIES
END COPY
GENER
 OPCODE
   # # OPCD ***
 END OPCODE
 PARM
   #
                 K ***
 END PARM
END GENER
PERLND
 GEN-INFO
   <PLS ><-----Name----->NBLKS Unit-systems Printer ***
                                 User t-series Engl Metr ***
                                       in out
         D,Grass,STEEP(10-20
                                1
                                   1
                                        1
                                             1
 END GEN-INFO
  *** Section PWATER***
 ACTIVITY
   <PLS > ******* Active Sections ******************************
  \# - \# ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC *** 30 0 0 0 0 0 0 0 0 0
 END ACTIVITY
 PRINT-INFO
```

```
END PRINT-INFO
 PWAT-PARM1
   <PLS > PWATER variable monthly parameter value flags ***
   END PWAT-PARM1
 PWAT-PARM2
  PWAT-PARM2

<PLS > PWATER input info: Part 2 ***

# - # ***FOREST LZSN INFILT LSUR SLSUR KVARY AGWRC

30 0 4.2 0.02 200 0.15 3 0.92

END PWAT-PARM2
 END PWAT-PARM2
 PWAT-PARM3
  PWATT-PARMS

<PLS > PWATER input info: Part 3 ***

# - # ***PETMAX PETMIN INFEXP INFILD

30 35 30 2 2
                                        INFILD DEEPFR BASETP AGWETP 2 0.4 0.05 0.05
 END PWAT-PARM3
 PWAT-PARM4
 MON-LZETPARM
  <PLS > PWATER input info: Part 3
  # - # JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC ***
30     0.4     0.4     0.4     0.6     0.6     0.6     0.6     0.4     0.4     0.4
 END MON-LZETPARM
 MON-INTERCEP
  <PLS > PWATER input info: Part 3
  # - # JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC ***
30     0.1     0.1     0.1     0.10.06     0.06     0.06     0.06     0.1     0.1     0.1
 END MON-INTERCEP (
 PWAT-STATE1
   <PLS > *** Initial conditions at start of simulation
    ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
      # *** CEPS SURS UZS IFWS LZS AGWS 0 0.15 0 4 0.05
                                                                    GWVS
  30
 END PWAT-STATE1
END PERLND
IMPLND
 GEN-INFO
  <PLS ><----- Vame----> Unit-systems Printer ***
  # - #
                     User t-series Engl Metr ***
                                  in out
 END GEN-INFO
 *** Section IWATER***
 ACTIVITY
   <PLS > ******** Active Sections **********************
   # - # ATMP SNOW IWAT SLD IWG IQAL ***
 END ACTIVITY
 PRINT-INFO
   <ILS > ******* Print-flags ******* PIVL PYR
   # - # ATMP SNOW IWAT SLD IWG IQAL *******
 END PRINT-INFO
 IWAT-PARM1
   <PLS > IWATER variable monthly parameter value flags ***
   # - # CSNO RTOP VRS VNN RTLI ***
 END IWAT-PARM1
```

```
IWAT-PARM2
   <PLS > IWATER input info: Part 2 *
# - # *** LSUR SLSUR NSUR RETSC
 END IWAT-PARM2
 IWAT-PARM3
            IWATER input info: Part 3
   <PLS >
   # - # ***PETMAX PETMIN
 END IWAT-PARM3
 IWAT-STATE1
  <PLS > *** Initial conditions at start of simulation
   # - # *** RETS SURS
 END IWAT-STATE1
END IMPLND
SCHEMATIC
                        <--Area--> <-Target-> MBLK *** <-factor-> <Name> # Tbl# ***
<-Source->
<Name> #
EX West***
                               10 COPY 501 12
10 COPY 501 13
PERLND 30
PERLND 30
                               10
EX East***
                             3.39 COPY 502 12
3.39 COPY 502 13
PERLND 30
PERLND 30
*****Routing*****
END SCHEMATIC
NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
END NETWORK
RCHRES
 GEN-INFO
   RCHRES Name Nexits Unit Systems Printer
                                                                   * * *
   # - #<----><---> User T-series Engl Metr LKFG
                                                                   * * *
                                                                   * * *
                                     in out
 END GEN-INFO
 *** Section RCHRES***
   # - # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
 END ACTIVITY
 PRINT-INFO
   <PLS > ********** Print-flags ********* PIVL PYR # - # HYDR ADCA CONS HEAT SED GQL OXRX NUTR PLNK PHCB PIVL PYR *******
 END PRINT-INFO
 HYDR-PARM1
   RCHRES Flags for each HYDR Section
   # - # VC A1 A2 A3 ODFVFG for each *** ODGTFG for each FUNCT for each FG FG FG possible exit *** possible exit possible exit ***
 END HYDR-PARM1
 HYDR-PARM2
  # - # FTABNO
                             DELTH
                                                 KS
                                                        DB50
                      LEN
                                      STCOR
                                                                   * * *
  <----><----><---->
```

```
END HYDR-PARM2
 HYDR-INIT
   # - # *** VOL Initial value of COLIND Initial value of OU.

for each possible exit for each possible exit
   RCHRES Initial conditions for each HYDR section
                                               Initial value of OUTDGT
                    <---><---><---><--->
 <---->
 END HYDR-INIT
END RCHRES
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES
EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
<Name> # <Name> # tem strg<-factor->strg <Name> # #
                                                         <Name> # # ***
MDM
      2 PREC ENGL 1
                                     PERLND
                                             1 999 EXTNL
                                                         PREC
                                             1 999 EXTNL PREC
1 999 EXTNL PETINP
WDM
       2 PREC
                 ENGL
                        1
                                      IMPLND
                                     PERLND
                ENGL 1
ENGL 1
MDM
       1 EVAP
       1 EVAP
                                     IMPLND 1 999 EXTNL PETINP
MDM
END EXT SOURCES
EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
1 1
                            12.1
                                            502 FLOW
COPY
      502 OUTPUT MEAN
                                      WDM
                                                       ENGL
                                                                REPL
END EXT TARGETS
MASS-LINK
<Volume> <-Grp> <-Member-><--Mult-->
                                     <Target>
                                                 <-Grp> <-Member->***
          <Name> # #<-factor->
                                                         <Name> # #***
<Name>
                                      <Name>
 MASS-LINK
               12
PERLND PWATER SURO
                         0.083333
                                     COPY
                                                   INPUT MEAN
 END MASS-LINK 12
 MASS-LINK
               13
PERLND PWATER IFWO
                         0.083333
                                     COPY
                                                   INPUT MEAN
 END MASS-LINK 13
```

END MASS-LINK

END RUN

#### Mitigated UCI File

RUN

```
GLOBAL
 WWHM4 model simulation
 START
             1959 10 01
                              END
                                     2004 09 30
 RUN INTERP OUTPUT LEVEL
                               0
 RESUME
            0 RUN
                   1
                                         UNIT SYSTEM
END GLOBAL
FILES
<File>
      <Un#>
               <---->***
<-ID->
WDM
          26
               Pacifica Estates.wdm
MESSU
          25
               MitPacifica Estates.MES
          27
               MitPacifica Estates.L61
          28
               MitPacifica Estates.L62
               POCPacifica Estates1.dat
          30
               POCPacifica Estates2.dat
          31
END FILES
OPN SEQUENCE
                      INDELT 00:60
    INGRP
     PERLND
                 28
     IMPLND
                  1
     IMPLND
                  2
                 30
     PERLND
                  2
     GENER
                  1
     RCHRES
     RCHRES
     GENER
     RCHRES
                  3
                  4
     RCHRES
     COPY
                502
     COPY
                  1
     COPY
                501
                601
     COPY
     DISPLY
                  2
     DISPLY
                  1
   END INGRP
END OPN SEQUENCE
DISPLY
 DISPLY-INFO1
    # - #<-----Title---->***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND
           Access Road
                                       MAX
                                                              1
                                                                      31
                                                                            9
                                                                   2
                                                              1
                                                                       30
                                                                            9
    1
            Surface tention Area
                                       MAX
 END DISPLY-INFO1
END DISPLY
COPY
 TIMESERIES
                NMN ***
    # - # NPT
   1
             1
                 1
  502
             1
                  1
  501
             1
                  1
  601
             1
                  1
 END TIMESERIES
END COPY
GENER
 OPCODE
        # OPCD ***
   #
   2
            24
   4
            24
 END OPCODE
 PARM
                  K ***
   #
                 0.
    2
                 0.
    4
 END PARM
END GENER
```

```
PERLND
 GEN-INFO
  <PLS ><-----Name----->NBLKS Unit-systems Printer ***
                    User t-series Engl Metr ***
                             in out
      D,Grass,FLAT(0-5%) 1
D,Grass,STEEP(10-20 1
  28 D, Grass, FLAT(0-5%)
                              1 1
                                     27
                           1
                                 1
  30
 END GEN-INFO
 *** Section PWATER***
 ACTIVITY
  # - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***
  END ACTIVITY
 PRINT-INFO
  <PLS > ********* Print-flags ************** PIVL PYR
  END PRINT-INFO
 PWAT-PARM1
  <PLS > PWATER variable monthly parameter value flags ***
 END PWAT-PARM1
 PWAT-PARM2
 ***
  # - # ***FOREST LZSN INFILT
28 0 4.8 0.04
30 0 4.2 0.02
                               LSUR SLSUR KVARY
200 0.05 3
200 0.15 3
                                                   AGWRC
                                                   0.92
  3.0
                                                    0.92
 END PWAT-PARM2
 PWAT-PARM3
  <PLS > PWATER input info: Part 3
  # - # ***PETMAX PETMIN INFEXP
28 35 30 2
                              INFILD DEEPFR
                                            BASETP AGWETP
                                                  0.05
                               2
                                      0.4
                                            0.05
  30
                   30
                                  2
                                       0.4
                                              0.05
                                                    0.05
 END PWAT-PARM3
 PWAT-PARM4
  <PLS > PWATER input info: Part 4
                             INTFW
1.5
1.5
                                       IRC LZETP 0.7 0.5
         CEPSC UZSN NSUR
                                             LZETP ***
         0.08
  28
30
              0.6
0.6
                      0.2
0.2
                                       0.7
          0.08
                                              0.5
 END PWAT-PARM4
 MON-LZETPARM
          PWATER input info: Part 3
                                  * * *
  <PLS >
  # - # JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC ***
  END MON-LZETPARM
 MON-INTERCEP
  <PLS > PWATER input info: Part 3
       END MON-INTERCEP
 PWAT-STATE1
  <PLS > *** Initial conditions at start of simulation
        ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
     ran from 1990 to end of 1992 (pac 1 11 00, non 12 4 *** CEPS SURS UZS IFWS LZS AGWS 0 0.05
                                                     GWVS
          0
  28
                                                       0
  30
             0
                    0
                        0.15
                                  0
                                        4
                                             0.05
                                                       n
 END PWAT-STATE1
```

```
IMPLND
   <PLS ><----Name----> Unit-systems Printer ***
                           User t-series Engl Metr ***
   # - #
                                 in out ***
                                              0
                                 1 1
         IMPERVIOUS-FLAT
                              1
                                           27
         IMPERVIOUS-MOD
                              1
                                   1
                                       1
 END GEN-INFO
 *** Section IWATER***
 ACTIVITY
   <PLS > ******** Active Sections **********************
   # - # ATMP SNOW IWAT SLD IWG IQAL
   1 0 0 1 0 0 0
2 0 0 1 0 0 0
                0
 END ACTIVITY
 PRINT-INFO
   <ILS > ******* Print-flags ******* PIVL PYR
   # - # ATMP SNOW IWAT SLD IWG IQAL *******
      1 9
               0 4
   2
                                            9
 END PRINT-INFO
 IWAT-PARM1
   <PLS > IWATER variable monthly parameter value flags ***
# - # CSNO RTOP VRS VNN RTLT ***
   1 0 0 0 0 2
                        0 1
 END IWAT-PARM1
 IWAT-PARM2
              IWATER input info: Part 2
   <PLS >
              LSUR <
                    SLSUR NSUR
                                        RETSC
             100
                     0.035
                                       0.1
                                0.05
   2
               100
                       0.1
                               0.05
                                          0.1
 END IWAT-PARM2
 IWAT-PARM3
            IWATER input info: Part 3
   # - # ***PETMAX PETMIN
           0
                      0
   1
   2
                 0
                          0
 END IWAT-PARM3
  IWAT-STATE1
   <PLS > *** Initial conditions at start of simulation
   # - # *** RETS SURS
              0
                          0
                 0
 END IWAT-STATE1
END IMPLND
SCHEMATIC
                        <--Area--> <-Target-> MBLK
<-factor-> <Name> # Tbl#
<-Source->
<Name> #
                        <-factor->
                                      <Name> #
                                                  Tbl#
Northerly Half Road and Lots***
PERLND 28
                             4.065
                                      RCHRES
                                                     2
                                                     3
PERLND 28
                              4.065
                                      RCHRES
                                               3
                                                     5
                             1.575
                                               3
IMPLND 1
                                      RCHRES
IMPLND
       2
                              0.55
                                      RCHRES
                                               3
                                                     5
Southerly Half Road and Lots***
                                                     2
PERLND 28
                              4.065
                                      RCHRES
PERLND 28
                              4.065
                                      RCHRES
                                               1
                                                     3
                             1.575
IMPLND
                                               1
                                                     5
       1
                                      RCHRES
IMPLND
                              0.55
                                      RCHRES
```

```
Access Road***
PERLND 30
                             0.86
                                     COPY
                                           502
                                                 12
PERLND 30
                             0.86
                                     COPY
                                           502
                                                 13
IMPLND
      2
                             0.15
                                     COPY
                                           502
                                                 15
*****Routing*****
                                     COPY
                                                 18
                               1
RCHRES
      1
                                             1
RCHRES
                                     RCHRES
                                             2.
                                                  8
       1
PERLND
       28
                             4.065
                                     COPY
                                             1
                                                  12
IMPLND
                             1.575
                                     COPY
                                             1
                                                  15
                             0.55
                                                  15
IMPLND
       2.
                                     COPY
                                             1
PERLND 28
                             4.065
                                             1
                                                 13
                                     COPY
                                     RCHRES 4
                                                  8
RCHRES
      3
                                1
                                            1
RCHRES
                                     COPY
RCHRES
                                1
                                     COPY
                                           501
                                                 17
                                           501
                                1
                                     COPY
                                                 17
RCHRES
                                     COPY
                                           501
                                                  17
RCHRES
      4
                                1
END SCHEMATIC
NETWORK
<-Volume-> <-Grp> <-Member-><-Tran <-Target vols> <-Grp> <-Member->
<Name> # #
                                DISPLY
      502 OUTPUT MEAN 1 1 12.1
                                                INPUT
                                             2
                                                        TIMSER 1
      501 OUTPUT MEAN 1 1 12.1
                                     DISPLY 1
                                                 INPUT TIMSER 1
GENER 2 OUTPUT TIMSER .0002778
GENER 4 OUTPUT TIMSER .0002778
                                                 EXTNL OUTDGT 1
                                    RCHRES 1
     4 OUTPUT TIMSER
                         .0002778
                                                 EXTNL OUTDGT 1
                                     RCHRES 3
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member-> ***
END NETWORK
RCHRES
 GEN-INFO
                       Nexits Unit Systems Printer
   RCHRES Name Nexits Unit Systems Printer # - #<----> User T-series Engl Metr LKFG
   RCHRES
                                                                   * * *
                                                                   * * *
                                     in out
        Surface tention -010 3 1
South Bioretenti-009 2 1
Surface tention -015 3 1
North Bioretenti-014 2 1
                                      1
                                          1
                                                   Ω
   2
                                      1
                                          1
                                              28
                                                       1
                                              28
                                                   0
                                      1
                                                       1
   3
                                          1
 END GEN-INFO
 *** Section RCHRES***
 ACTIVITY
   <PLS > ********* Active Sections *********************
   # - # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
              0 0 0 0 0 0 0 0
   1
            1
                    Ω
                         0
   2
            1
                Λ
                             0
                                 Ω
                                      Ω
                                          Λ
                                               Λ
                                                   Λ
                               0
                                            0
                0 0
                        0
                             0
                                     0
                                                   0
   3
            1
                                          0
   4
                0
                     0
                         0
                             0
                                  0
 END ACTIVITY
 PRINT-INFO
   <PLS > ******** Print-flags ********* PIVL PYR
   # - # HYDR ADCA CONS HEAT SED GOL OXRX NUTR PLNK PHCB PIVL
                                                          PYR
                                                               ******
                                0 0 0 0 0 0 0 0 0
               0 0 0
   1
           4
                             0
                                                       1
                                                            9
                    0
                         0
                             0
   2.
            4
                Ω
                                                       1
   3
                Ω
                   0
                        0 0 0
                                     0
                                          0 0
                                                   0
                                                       1
                                                            9
                                  0
 END PRINT-INFO
 HYDR-PARM1
   RCHRES Flags for each HYDR Section
   # - # VC A1 A2 A3 ODFVFG for each *** ODGTFG for each FUNCT for each
                    possible exit *** possible exit
          FG FG FG FG
                                                        possible exit
                      * * * * *
            * * *
                                                        ***
                       4 5 6 0 0
                                         0 1 0 0 0
            1 0 0
                                                          2 1
                                                               2
                                                                 2 2
   1
             1 0 0
                       4 5 0 0 0
                                         0 0 0 0 0
                                                          2 2 2 2 2
   2
```

```
0 1 0 0
     4
  END HYDR-PARM1
  HYDR-PARM2
    # - # FTABNO LEN DELTH STCOR KS DB50
                                                                                                       * * *
  <----><----><----><---->
           1 0.01 0.0 0.0 0.5 0.0
2 0.01 0.0 0.0 0.5 0.0
3 0.01 0.0 0.0 0.5 0.0
4 0.02 0.0 0.0 0.5 0.0
     1
     2
     3
     4
  END HYDR-PARM2
  HYDR-INIT
    RCHRES Initial conditions for each HYDR section
     <---><---><---> *** <---><--->
  <---->
           0

      4.0
      5.0
      6.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0.0
      0
     1
                      0
     3
                      Ω
  END HYDR-INIT
END RCHRES
SPEC-ACTIONS
*** User-Defined Variable Quantity Lines
* * *
                                    <---->
*** kwd varnam optyp opn vari $1 s2 s3 tp multiply lc ls ac as agfn ***
  <****> <---> <---> <--> <-> <****
  UVQUAN v2m2 GLOBAL WORKSP 1 3
UVQUAN vpo2 GLOBAL WORKSP 2 3
UVQUAN v2d2 GENER 2 K 1 3
*** User-Defined Variable Quantity Lines
UVQUAN vol4 RCHRES 4 VOL
UVQUAN v2m4 GLOBAL WORKSP 3
UVQUAN vpo4 GLOBAL WORKSP 4
UVQUAN v2d4 GENER 4 K 1
                                                   4
*** User-Defined Target Variable Names
***
      addr or
                                                                   addr or
***
                          <--->
                                                                  <--->
*** kwd varnam ct vari s1 s2 s3 frac oper <****> <---><-><-><-><-><-><->
                                                                   vari s1 s2 s3 frac oper
                                                                   <---><-><-> <--->
  UVNAME v2m2 1 WORKSP 1 1.0 QUAN UVNAME vpo2 1 WORKSP 2 1.0 QUAN UVNAME v2d2 1 K 1 1.0 QUAN
*** User-Defined Target Variable Names
* * *
                          addr or
                                                                   addr or
***
                          <--->
                                                                  <--->
*** kwd varnam ct vari s1 s2 s3 frac oper
                                                                   vari s1 s2 s3 frac oper
            <---><-> <---> <-->
                                                                   <---><-><-> <-->
  UVNAME v2m4 1 WORKSP 3
UVNAME vpo4 1 WORKSP 4
UVNAME v2d4 1 K 1
                                                 1.0 QUAN
                                                   1.0 QUAN
                                                 1.0 QUAN
*** opt foplop dcdts yr mo dy hr mn d t vnam s1 s2 s3 ac quantity tc ts rp
  = 3554.
*** Compute remaining available pore space
                                                                            = v2m2
  GENER 2
                                                        vpo2
             2
                                                        vpo2
                                                                            -= vol2
  GENER
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo2 < 0.0) THEN
                                                                            = 0.0
 GENER 2
                                                        vpo2
END IF
*** Infiltration volume
```

```
GENER
                                        v2d2
                                                       = vpo2
                                        vnam s1 s2 s3 ac quantity tc ts rp
*** opt foplop dcdts yr mo dy hr mn d t
  <----> <> <-><->
                                        v2m4
                                                       = 10323.
*** Compute remaining available pore space
                                        vpo4
                                                        = v2m4
                                        vpo4
 GENER
                                                       -= vol4
*** Check to see if VPORA goes negative; if so set VPORA = 0.0
IF (vpo4 < 0.0) THEN
 GENER
                                        vpo4
END IF
*** Infiltration volume
                                        v2d4
 GENER 4
                                                        = vpo4
END SPEC-ACTIONS
FTABLES
 FTABLE
  59 5
                    Volume Outflow1 Outflow2 Velocity Travel Time***
    Depth
              Area
            (acres) (acre-ft)
                                                           (Minutes)***
     (ft)
                              (cfs)
                                        (cfs)
                                                  (ft/sec)
 0.000000 \quad 0.077227 \quad 0.000000 \quad 0.000000 \quad 0.000000
           0.076643 0.001134 0.000000 0.000000
 0.060440
          0.076003 0.002281 0.000000 0.000000
 0.120879
 0.181319 0.075365 0.003441
                              0.000000 0.004481
 0.241758 0.074731 0.004613
                              0.000000 0.004481
 0.302198 0.074099 0.005797 0.000000 0.004481
 0.362637 0.073469 0.006995 0.000000 0.004481
 0.423077
           0.072843
                    0.008205
                              0.000000 0.004481
 0.483516
           0.072219
                    0.009428
                              0.000000 0.004481
 0.543956
           0.071598
                    0.010664
                              0.000000 0.004481
 0.604396
           0.070979
                     0.011913
                              0.000000 0.004481
                    0.013176 0.000000 0.004481
          0.070363
 0.664835
                    0.014451 0.000000 0.004481
0.015739 0.000000 0.004481
0.017041 0.000000 0.004481
 0.725275 0.069750
  0.785714
           0.069140
  0.846154 0.068532
           0.067927
                     0.018356 0.000000 0.004481
 0.906593
 0.967033
           0.067324 0.019685 0.000000 0.004481
           0.066724 0.021027
0.066127 0.022382
                                        0.004481
 1.027473
                              0.000000
 1.087912
                              0.000000
                                        0.004481
 1.148352
           0.065533 0.023752
                              0.000000
                                        0.004481
                    0.025135 0.000000 0.004481
 1.208791
           0.064941
           0.064352 0.026531 0.000000 0.004481
 1.269231
 1.329670
           0.063766 0.027942
                              0.000000 0.004481
 1.390110 0.063182 0.029366 0.000000 0.004481
 1.450549 0.062601 0.030805 0.000000 0.004481
 1.510989 0.062023 0.032240 0.000000 0.004481
                              0.000000 0.004481
 1.571429
           0.061447
                    0.033689
 1.631868
           0.060874
                    0.035152
                              0.000000
                                        0.004481
 1.692308
           0.060304
                    0.036629
                               0.000000
                                        0.004481
           0.059736
                              0.000000 0.004481
 1.752747
                    0.038120
                    0.039626
 1.813187
           0.059172
                              0.000000 0.004481
 1.873626
           0.058609
                    0.041145
                              0.000000 0.004481
 1.934066 0.058050 0.042679 0.000000 0.004481
 1.994505 0.057493
                    0.044228 0.000000 0.004481
  2.054945
           0.056939
                    0.045791 0.000000 0.004481
 2.115385
           0.056387
                    0.047368
                              0.000000 0.004481
 2.175824
           0.055839
                    0.048960
                              0.000000
                                        0.004481
           0.055293
                    0.050567
  2.236264
                               0.000000
                                        0.004481
                              0.00000
 2.296703
           0.054749
                    0.052189
                                        0.004481
                              0.000000 0.004481
 2.357143
           0.054208
                    0.053825
 2.417582
           0.053670
                    0.055476
                              0.000000 0.004481
           0.053135 0.057142
  2.478022
                              0.000000 0.004481
 2.538462 0.052602 0.058823 0.000000 0.004481
  2.598901 0.052072
                    0.060520 0.000000 0.004481
                              0.000000 0.004481
 2.659341
           0.051545
                    0.062231
                              0.000000 0.004481
  2.719780
           0.051020
                    0.063957
  2.780220
           0.050498
                     0.065699
                               0.000000
                                        0.004481
  2.840659
           0.049979
                     0.067456
                               0.000000
                                        0.004481
 2.901099
           0.049463
                     0.069229
                              0.000000
                                        0.004481
           0.048949
                     0.071017
                               0.000000
  2.961538
                                        0.004481
  3.021978
           0.048438
                    0.072821 0.003274 0.004481
```

```
3.082418
            0.047929
                       0.074640
                                  0.007272
                                             0.004481
                                             0.004481
  3.142857
            0.047423
                       0.076475
                                  0.009751
                       0.078326
  3.203297
            0.046920
                                  0.011720
                                             0.004481
  3.263736
            0.046420
                       0.080192
                                  0.013406
                                             0.004481
  3.324176
            0.045922
                       0.082075
                                  0.014909
                                             0.004481
  3.384615
            0.045427
                       0.083973
                                  0.016285
                                             0.004481
  3.445055
            0.044934
                       0.085887
                                  0.017590
                                             0.004481
  3.500000
                                  0.019075
            0.044444
                       0.184047
                                             0.004481
  END FTABLE
               2
  FTABLE
               1
   35
     Depth
                 Area
                         Volume
                                  Outflow1
                                             Outflow2
                                                        outflow 3 Velocity
                                                                             Travel
Time***
                                               (cfs)
                                                          (cfs)
      (ft)
              (acres) (acre-ft)
                                   (cfs)
                                                                   (ft/sec)
(Minutes) * * *
            0.044444
                                  0.000000
                                             0.019075
                                                        0.00000
  0.000000
                       0.000000
                                                        0.00000
  0.060440
            0.077872
                       0.004687
                                  0.000000
                                             0.238609
                                             0.247851
  0.120879
            0.078520
                       0.009413
                                  0.00000
                                                        0.00000
  0.181319
            0.079170
                       0.014179
                                  0.00000
                                             0.257093
                                                        0.00000
  0.241758
            0.079823
                       0.018983
                                  0.000000
                                             0.266335
                                                        0.000000
            0.080479
                       0.023828
                                             0.275577
  0.302198
                                  0.000000
                                                        0.000000
  0.362637
            0.081138
                       0.028712
                                  0.00000
                                             0.284819
                                                        0.00000
  0.423077
            0.081799
                       0.033636
                                  0.00000
                                             0.294061
                                                        0.000000
  0.483516
            0.082463
                       0.038600
                                  0.00000
                                             0.303303
                                                        0.000000
  0.543956
            0.083130
                       0.043604
                                  0.007672
                                             0.312545
                                                        0.000000
                                  0.028081
  0.604396
            0.083799
                       0.048648
                                             0.321786
                                                        0.000000
                                  0.055713
  0.664835
            0.084471
                       0.053733
                                             0.331028
                                                        0.000000
            0.085146
                       0.058859
                                  0.089013
  0.725275
                                             0.340270
                                                        0.000000
  0.785714
            0.085823
                       0.064026
                                  0.127140
                                             0.349512
                                                        0.000000
                                  0.169546
  0.846154
            0.086503
                       0.069233
                                             0.358754
                                                        0.000000
  0.906593
            0.087186
                       0.074482
                                  0.215836
                                             0.367996
                                                        0.000000
  0.967033
            0.087871
                       0.079772
                                  0.265709
                                             0.377238
                                                        0.000000
  1.027473
            0.088559
                       0.085104
                                  0.338680
                                             0.386480
                                                        0.00000
  1.087912
             0.089250
                       0.090477
                                  0.548189
                                             0.395722
                                                        0.000000
            0.089943
                       0.095893
                                0.850818
                                             0.404964
                                                        0.000000
  1.148352
  1.208791
            0.090640
                       0.101350
                                  1.223476
                                             0.414206
                                                        0.00000
  1.269231
            0.091338
                      0.106849
                                  1.654842
                                             0.423447
                                                        0.00000
            0.092040
                                             0.432689
                                                        0.00000
  1.329670
                       0.112391
                                  2.137795
  1.390110
            0.092744
                       0.117975
                                  2.667317
                                             0.441931
                                                        0.00000
                                             0.451173
  1.450549
            0.093451
                       0.123602
                                  3.239623
                                                        0.000000
            0.094160
                       0.129271
                                  3.851725
                                             0.460415
  1.510989
                                                        0.000000
  1.571429
            0.094873
                       0.134984
                                  4.501186
                                             0.469657
                                                        0.00000
  1.631868
            0.095588
                       0.140739
                                  5.185968
                                             0.478899
                                                        0.00000
  1.692308
            0.096305
                       0.146538
                                  5.904336
                                             0.488141
                                                        0.000000
            0.097025
                                             0.497383
                                                        0.00000
  1.752747
                       0.152381
                                  6.654787
  1.813187
            0.097748
                       0.158267
                                  7.436004
                                             0.506625
                                                        0.00000
  1.873626
            0.098474
                       0.164197
                                  8.246820
                                             0.515866
                                                        0.000000
  1.934066
             0.099202
                       0.170170
                                  9.086191
                                             0.525108
                                                        0.00000
            0.099933
                       0.176188
                                  9.953177
                                             0.534350
  1.994505
                                                        0.000000
  2.000000
            0.100000
                       0.176738
                                  10.84692
                                             0.535190
                                                        0.000000
  END FTABLE
              1
  FTABLE
   59
                                                                   Travel Time***
     Depth
                 Area
                         Volume
                                  Outflow1
                                             Outflow2
                                                        Velocity
      (ft)
              (acres)
                      (acre-ft)
                                   (cfs)
                                               (cfs)
                                                        (ft/sec)
                                                                     (Minutes) * * *
  0.000000
                                             0.00000
            0.202847
                       0.000000
                                  0.00000
  0.060440
            0.201899
                       0.003741
                                  0.00000
                                             0.00000
  0.120879
            0.200860
                       0.007504
                                  0.000000
                                             0.000000
  0.181319
            0.199823
                       0.011291
                                  0.000000
                                             0.014815
  0.241758
            0.198788
                       0.015099
                                  0.00000
                                             0.014815
            0.197757
                       0.018931
                                  0.00000
  0.302198
                                             0.014815
  0.362637
            0.196728
                       0.022786
                                  0.000000
                                             0.014815
  0.423077
            0.195702
                       0.026663
                                  0.000000
                                             0.014815
  0.483516
                                  0.000000
            0.194678
                       0.030564
                                             0.014815
  0.543956
            0.193657
                       0.034488
                                  0.00000
                                             0.014815
  0.604396
            0.192639
                       0.038435
                                  0.00000
                                             0.014815
  0.664835
            0.191624
                       0.042405
                                  0.000000
                                             0.014815
  0.725275
            0.190611
                       0.046398
                                  0.000000
                                             0.014815
                       0.050415
  0.785714
            0.189601
                                  0.00000
                                             0.014815
                                  0.000000
  0.846154
            0.188593
                       0.054455
                                             0.014815
```

```
0.906593
             0.187589
                       0.058518
                                  0.000000
                                             0.014815
                                             0.014815
                                  0.000000
  0.967033
             0.186587
                       0.062606
  1.027473
             0.185587
                       0.066716
                                  0.00000
                                             0.014815
  1.087912
             0.184591
                       0.070851
                                  0.00000
                                             0.014815
             0.183597
                       0.075009
                                  0.00000
  1.148352
                                             0.014815
  1.208791
             0.182605
                       0.079191
                                  0.00000
                                             0.014815
                                  0.000000
                                             0.014815
  1.269231
             0.181617
                       0.083397
                       0.087627
                                  0.000000
  1.329670
             0.180631
                                             0.014815
  1.390110
             0.179647
                       0.091881
                                  0.00000
                                             0.014815
  1.450549
             0.178667
                       0.096160
                                  0.00000
                                             0.014815
  1.510989
             0.177689
                       0.100411
                                  0.000000
                                             0.014815
             0.176714
  1.571429
                       0.104686
                                  0.000000
                                             0.014815
  1.631868
             0.175741
                       0.108985
                                  0.00000
                                             0.014815
  1.692308
             0.174771
                       0.113308
                                  0.000000
                                             0.014815
  1.752747
             0.173804
                       0.117655
                                  0.00000
                                             0.014815
                                  0.00000
  1.813187
             0.172840
                       0.122027
                                             0.014815
                       0.126423
  1.873626
             0.171878
                                  0.000000
                                             0.014815
                                  0.00000
             0.170919
                       0.130843
                                             0.014815
  1.934066
  1.994505
             0.169962
                       0.135288
                                  0.00000
                                             0.014815
  2.054945
             0.169009
                       0.139757
                                  0.00000
                                             0.014815
                       0.144250
  2.115385
             0.168058
                                  0.000000
                                             0.014815
  2.175824
             0.167109
                       0.148769
                                  0.00000
                                             0.014815
  2.236264
             0.166164
                       0.153312
                                  0.00000
                                             0.014815
  2.296703
                       0.157880
                                  0.00000
             0.165221
                                             0.014815
  2.357143
             0.164280
                       0.162472
                                  0.000000
                                             0.014815
                                  0.000000
  2.417582
             0.163343
                       0.167090
                                             0.014815
  2.478022
                                  0.00000
             0.162408
                       0.171732
                                             0.014815
                                  0.00000
                       0.176400
  2.538462
             0.161475
                                             0.014815
  2.598901
             0.160546
                       0.181092
                                  0.000000 0.014815
  2.659341
             0.159619
                       0.185810
                                  0.000000
                                             0.014815
                       0.190553
  2.719780
             0.158695
                                  0.000000
                                             0.014815
                       0.195321
  2.780220
             0.157773
                                  0.000000
                                             0.014815
  2.840659
             0.156854
                       0.200115
                                  0.000000
                                             0.014815
  2.901099
             0.155938
                       0.204934
                                  0.000000
                                             0.014815
             0.155024
                       0.209779
                                  0.000000
  2.961538
                                             0.014815
  3.021978
             0.154114
                       0.214649
                                  0.003274
                                             0.014815
  3.082418
             0.153206
                       0.219545
                                  0.007272
                                             0.014815
  3.142857
             0.152300
                       0.224466
                                  0.009751
                                             0.014815
  3.203297
             0.151397
                       0.229414
                                  0.011720
                                             0.014815
                                             0.014815
  3.263736
             0.150497
                       0.234387
                                  0.013406
             0.149600
                                  0.014909
  3.324176
                       0.239386
                                             0.014815
  3.384615
             0.148705
                       0.244411
                                  0.016285
                                             0.014815
  3.445055
             0.147813
                       0.249462
                                  0.017590
                                             0.014815
  3.500000
             0.146924
                       0.533561
                                  0.019075
                                             0.014815
  END FTABLE
               4
               3
  FTABLE
   35
                          Volume
                                             Outflow2
                                                        outflow 3 Velocity
     Depth
                 Area
                                  Outflow1
                                                                             Travel
Time***
      (ft)
              (acres) (acre-ft)
                                   (cfs)
                                               (cfs)
                                                          (cfs)
                                                                   (ft/sec)
(Minutes) * * *
  0.000000
            0.146924
                       0.000000
                                  0.000000
                                             0.019075
                                                        0.00000
  0.060440
             0.203891
                       0.012292
                                  0.000000
                                             0.788791
                                                        0.00000
             0.204939
                       0.024646
                                  0.00000
                                                        0.00000
  0.120879
                                             0.819343
  0.181319
             0.205989
                       0.037064
                                  0.00000
                                             0.849894
                                                        0.00000
  0.241758
             0.207042
                       0.049546
                                  0.00000
                                             0.880446
                                                        0.00000
  0.302198
             0.208097
                       0.062092
                                  0.00000
                                             0.910998
                                                        0.00000
  0.362637
             0.209155
                       0.074701
                                  0.000000
                                             0.941550
                                                        0.000000
  0.423077
             0.210216
                       0.087374
                                  0.000000
                                             0.972101
                                                        0.000000
  0.483516
             0.211280
                       0.100112
                                  0.00000
                                             1.002653
                                                        0.00000
  0.543956
             0.212346
                       0.112914
                                  0.007672
                                             1.033205
                                                        0.000000
  0.604396
             0.213415
                       0.125780
                                  0.028081
                                             1.063757
                                                        0.00000
  0.664835
             0.214486
                       0.138711
                                  0.055713
                                             1.094309
                                                        0.000000
             0.215561
                       0.151707
                                  0.089013
                                                        0.00000
  0.725275
                                             1.124860
  0.785714
                       0.164768
                                  0.127140
                                                        0.00000
             0.216638
                                             1.155412
  0.846154
             0.217717
                       0.177894
                                  0.169546
                                             1.185964
                                                        0.00000
  0.906593
             0.218800
                       0.191085
                                  0.215836
                                             1.216516
                                                        0.000000
  0.967033
             0.219885
                       0.204342
                                  0.265709
                                             1.247067
                                                        0.000000
                                             1.277619
  1.027473
             0.220972
                       0.217665
                                  0.338680
                                                        0.00000
                                  0.548189
  1.087912
             0.222063
                       0.231053
                                             1.308171
                                                        0.00000
```

```
1.148352
            0.223156
                       0.244508
                                  0.850818
                                             1.338723
                                                        0.000000
  1.208791
            0.224251
                       0.258028
                                  1.223476
                                             1.369274
                                                        0.000000
                       0.271615
  1.269231
            0.225350
                                  1.654842
                                             1.399826
                                                        0.000000
  1.329670
            0.226451
                        0.285268
                                  2.137795
                                             1.430378
                                                        0.000000
            0.227555
                       0.298988
                                  2.667317
                                             1.460930
                                                        0.000000
  1.390110
  1.450549
             0.228661
                       0.312775
                                  3.239623
                                             1.491481
                                                        0.000000
  1.510989
            0.229770
                       0.326629
                                  3.851725
                                             1.522033
                                                        0.000000
  1.571429
            0.230882
                       0.340550
                                  4.501186
                                             1.552585
                                                        0.000000
  1.631868
             0.231997
                        0.354538
                                  5.185968
                                             1.583137
                                                        0.000000
  1.692308
             0.233114
                       0.368593
                                  5.904336
                                             1.613688
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             0.234234
                       0.382716
                                  6.654787
                                             1.644240
                                                        0.000000
             0.235356
                                  7.436004
                                             1.674792
                                                        0.000000
  1.813187
                       0.396907
  1.873626
             0.236482
                        0.411166
                                  8.246820
                                             1.705344
                                                        0.000000
  1.934066
             0.237609
                        0.425493
                                  9.086191
                                             1.735896
                                                        0.000000
  1.994505
             0.238740
                        0.439888
                                  9.953177
                                             1.766447
                                                        0.00000
                        0.441200
            0.238843
                                  10.84692
                                             1.769225
                                                        0.00000
  2.000000
  END FTABLE 3
END FTABLES
EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->
         # <Name> # tem strg<-factor->strg <Name>
                                                        # #
                                                                      <Name> # #
<Name>
                                                        1 999 EXTNL
WDM
          2 PREC
                     ENGL
                              1
                                              PERLND
                                                                      PREC
WDM
          2 PREC
                              1
                                                        1 999 EXTNL
                                                                      PREC
                     ENGL
                                              IMPLND
                                                        1 999 EXTNL
WDM
         1 EVAP
                     ENGL
                              1
                                              PERLND
                                                                      PETINP
WDM
                     ENGL
                                              IMPLND
                                                        1 999 EXTNL
         1 EVAP
                              1
                                                                      PETINP
WDM
         2 PREC
                     ENGL
                              1
                                              RCHRES
                                                        1
                                                               EXTNL
                                                                      PREC
          2
                                                        3
WDM
           PREC
                     ENGL
                              1
                                              RCHRES
                                                               EXTNL
                                                                      PREC
WDM
          1 EVAP
                     ENGL
                              0.5
                                              RCHRES
                                                        1
                                                               EXTNL
                                                                      POTEV
                              0.7
                                                        2
WDM
          1 EVAP
                     ENGL
                                              RCHRES
                                                               EXTNL
                                                                      POTEV
                              0.5
                                                        3
WDM
          1 EVAP
                     ENGL
                                              RCHRES
                                                               EXTNL
                                                                      POTEV
MDM
         1 EVAP
                     ENGL
                              0.7
                                              RCHRES
                                                               EXTNL
                                                                      POTEV
END EXT SOURCES
EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
                   <Name> # #<-factor->strg <Name>
                                                        # <Name>
<Name>
                                                                     tem strq strq***
COPY
          2 OUTPUT MEAN
                           1 1
                                   12.1
                                              MDM
                                                      702 FLOW
                                                                    ENGL
                                                                               REPL
                                   12.1
                                                      802 FLOW
COPY
       502 OUTPUT MEAN
                           1 1
                                              WDM
                                                                    ENGL
                                                                               REPL
       602 OUTPUT MEAN
                                                      902 FLOW
COPY
                           1 1
                                   12.1
                                              MDM
                                                                    ENGL
                                                                               REPL
RCHRES
          2 HYDR
                   RO
                           1 1
                                       1
                                              WDM
                                                     1005 FLOW
                                                                    ENGL
                                                                               REPL
RCHRES
          2 HYDR
                   0
                           1 1
                                       1
                                              WDM
                                                     1006 FLOW
                                                                    ENGL
                                                                               REPL
                           2 1
                                                     1007 FLOW
RCHRES
         2 HYDR
                   \cap
                                       1
                                              WDM
                                                                    ENGL
                                                                               REPL
         2 HYDR
                   STAGE
                           1 1
                                       1
                                                     1008 STAG
RCHRES
                                              WDM
                                                                    ENGL
                                                                               REPL
RCHRES
         1 HYDR
                   STAGE
                           1 1
                                       1
                                              WDM
                                                     1009 STAG
                                                                    ENGL
                                                                               REPL
                           1 1
                                       1
                                                     1010 FLOW
RCHRES
         1 HYDR
                   0
                                              WDM
                                                                    ENGL
                                                                               REPL
          1 OUTPUT MEAN
                           1
                             1
                                   12.1
                                              WDM
                                                      701 FLOW
                                                                    ENGL
                                                                               REPL
COPY
       501 OUTPUT MEAN
                           1 1
                                                      801 FLOW
COPY
                                   12.1
                                              WDM
                                                                    ENGL
                                                                               REPL
                                                      901 FLOW
COPY
       601 OUTPUT MEAN
                           1 1
                                   12.1
                                              MDM
                                                                    ENGL
                                                                               REPL
         4 HYDR
                           1 1
                                                     1011 FLOW
RCHRES
                   RO
                                      1
                                              WDM
                                                                    ENGL
                                                                               REPL
         4 HYDR
                           1 1
                                       1
                                                     1012 FLOW
RCHRES
                   0
                                              WDM
                                                                    ENGL
                                                                               REPL
RCHRES
          4 HYDR
                   0
                           2 1
                                       1
                                              WDM
                                                     1013 FLOW
                                                                    ENGL
                                                                               REPL
         4 HYDR
                   STAGE
                           1 1
                                       1
                                                     1014 STAG
RCHRES
                                              WDM
                                                                    ENGL
                                                                               REPL
         3 HYDR
                   STAGE
                           1 1
                                       1
                                              M \cap M
                                                     1015 STAG
                                                                    ENGL
RCHRES
                                                                               REPL
                           1 1
                                       1
RCHRES
          3 HYDR
                   0
                                              WDM
                                                     1016 FLOW
                                                                    ENGL
                                                                               REPL
END EXT TARGETS
MASS-LINK
<Volume>
            <-Grp> <-Member-><--Mult-->
                                                               <-Grp> <-Member->***
                                              <Target>
<Name>
                   <Name> # #<-factor->
                                              <Name>
                                                                      <Name> # #***
  MASS-LINK
                    2
PERLND
           PWATER SURO
                               0.083333
                                              RCHRES
                                                               INFLOW IVOL
  END MASS-LINK
                    2
  MASS-LINK
                    3
PERLND
           PWATER IFWO
                               0.083333
                                              RCHRES
                                                               INFLOW IVOL
  END MASS-LINK
                    3
  MASS-LINK
                    5
```

IMPLND IWATER END MASS-LINK			0.083333	RCHRES	INFLOW	IVOL
MASS-LINK RCHRES OFLOW END MASS-LINK	OVOL	2		RCHRES	INFLOW	IVOL
MASS-LINK PERLND PWATER END MASS-LINK	SURO		0.083333	COPY	INPUT	MEAN
MASS-LINK PERLND PWATER END MASS-LINK	IFWO		0.083333	COPY	INPUT	MEAN
MASS-LINK IMPLND IWATER END MASS-LINK	SURO		0.083333	СОРУ	INPUT	MEAN
MASS-LINK RCHRES OFLOW END MASS-LINK	OVOL	1		COPY	INPUT	MEAN
MASS-LINK RCHRES OFLOW END MASS-LINK	OVOL	2	$\wedge$	COPY	INPUT	MEAN
END MASS-LINK						
END RUN						
	<	0				
		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	<b>→</b> >			

#### Predeveloped HSPF Message File



#### Mitigated HSPF Message File



#### Disclaimer

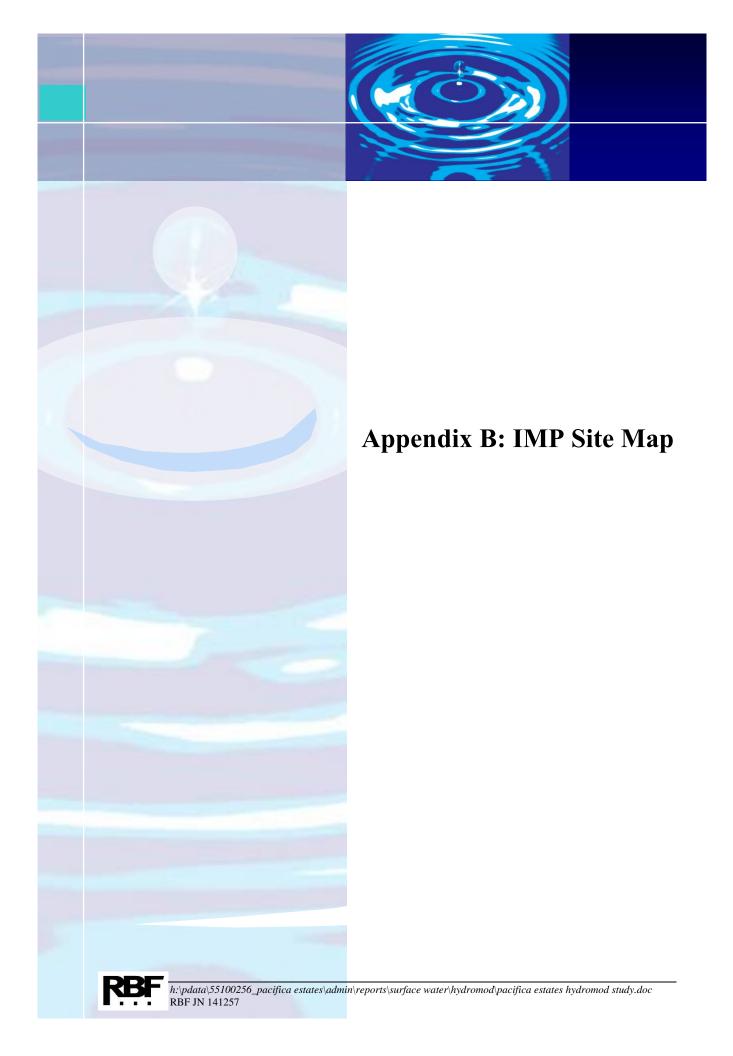
#### Legal Notice

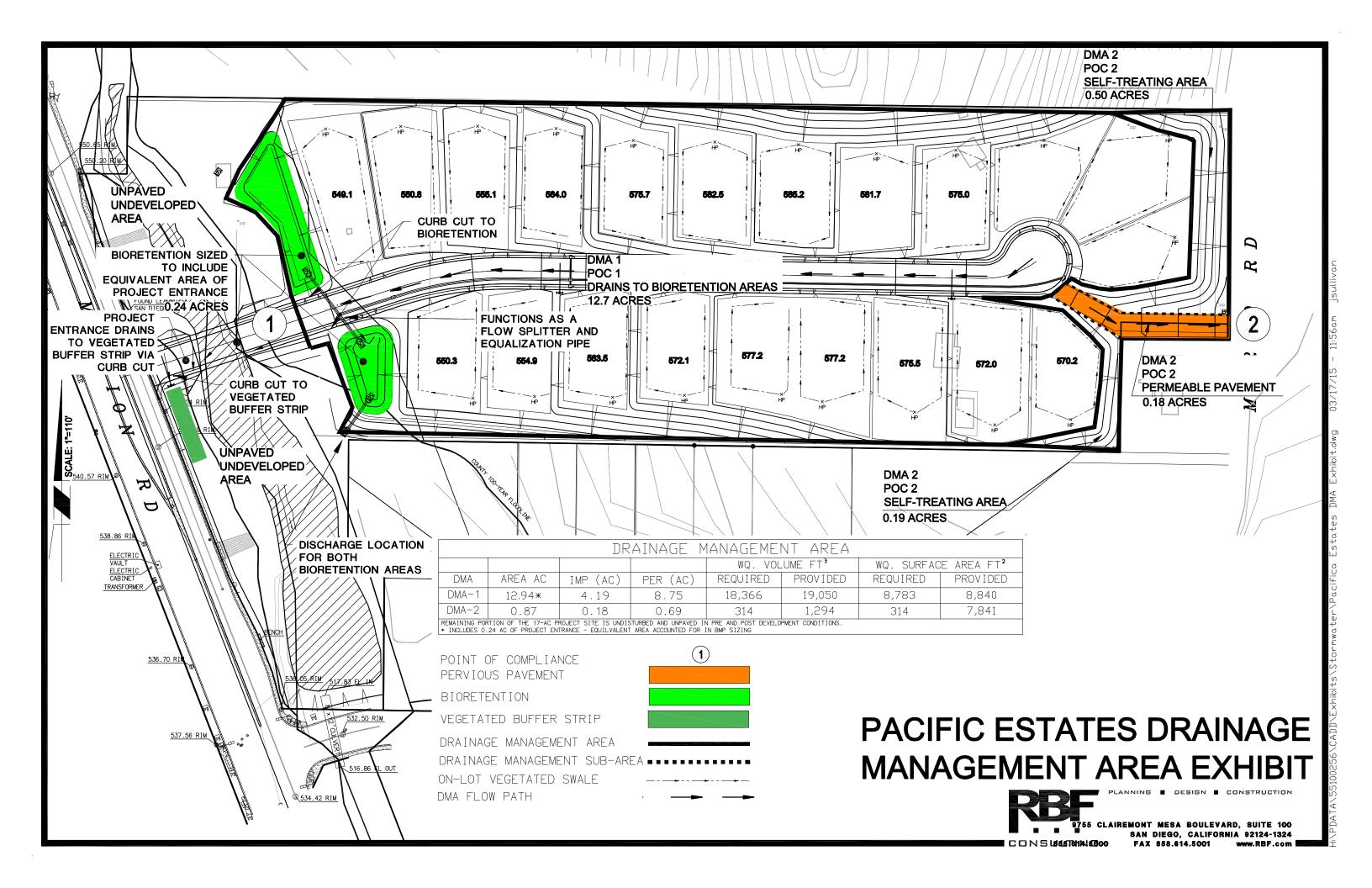
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## **ATTACHMENT I**

## **Geomorphic Assessment**

(Contact County staff immediately if you are planning to conduct a Geomorphic Assessment. A Geomorphic Assessment must be performed if the project is using a "Medium" low flow threshold of 0.3Q<sub>2</sub> or a "High" low flow threshold of 0.5Q<sub>2</sub>.)

# ATTACHMENT J

## **HMP Exemption Documentation**

(if applicable)

# ATTACHMENT K

## Addendum